GOVERNMENT DEGREE COLLEGE FOR WOMEN, KARIMNAGAR, TELANGANA

1.3.2 Percentage of students undertaking project work/field work/internship (Data for the latest completed academic year)

Name of the department	Nature of the work	Title of the project work/field work/ internships	Programme Name	Programme Code	List of students undertaking project work/field work/internship (Upload excel file)	Link
chemistry	Project work	Analysis of fruits and vegetable juices for their acidity			Kante Ravali	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
					A.Mahanthi	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
					Nuligonda Anusha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
					B.Sandhya Rani	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
					Farnaaz	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	The chemistry of watermelon	B.Sc(Physical Science)		P.Swapna	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		Keerthi Anusha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		Rukhsar Begum	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		R.Nikhitha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		M.Vineetha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
		The chemistry of plant flowering	B.Sc(Physical Science)		J.Supriya	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf

chemistry	Project work		B.Sc(Physical Science)		A.Sravani	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		B.Vaishnavi	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		M.Mayuri	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		V.Sai Sharanya	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	Names of the reagents in alphabetical order	B.Sc(Physical Science)		Iffath Unnisa Sabry	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		Romana Raheem	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		Subia Tahreem	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		Madiha Tul Ifra	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry		The chemistry of cold medicines	B.Sc(Physical Science)		M.Pratyusha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	The chemistry of strawberries	B.Sc(Physical Science)		Ch.Supraja	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		R.Manasa	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		B.Kalyani	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		K.Rajeshwari	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		S.Sowmya	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf

chemistry	Project work	Characterstics of a catalyst and types of catalyst	B.Sc(Physical Science)		Sumayya Afreen	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		Syeda Ayesha Fatima	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		Zareena Begum	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		T.Pooja	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		S.Rohini	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	Chemistry of fireworks	B.Sc(Physical Science)		Zuha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		K.Ananya	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		B.Jyothsna	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		Ayesha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	Amino acids - uses	B.Sc(Physical Science)		Nousheen Fathima	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		Mahenoor	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		Lubna Fiza	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	Principles of green chemistry	B.Sc(Physical Science)		K.Ramya	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	Elements of periodic table	B.Sc(Physical Science)		Sadiya Konain	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		Lubna Nazneen	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf

chemistry	Project work	Magnetic properties of co.ordination compound	B.Sc(Physical Science)		1.Ayesha Athar	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		2.K.Sushma,Mbzc	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		3.K.Kalpana	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		4.K.K.Nikhitha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	Colligative properties	B.Sc(Physical Science)		1.Nisha Afreen	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		2.D.Geethanjali	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		3.Shaziya Khanam	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	Electrode	B.Sc(Physical Science)		1.Sara Shahewar	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		2.D.Anusha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		3.Meraj Firdouse	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		4.D.Bhavani	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		5.B.Rachana	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Physical Science)		6.K.Bhavya	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	Spectral and magnetic properties of metal complexes	B.Sc(Life Science)		B.Sandhya Rani,Mpc-Iv Sem	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		E.Thriveni,Mpc -Iv	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf

			B.Sc(Life Science)		Farnaz Zuheen-Iv	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	Colour properties of transition elements	B.Sc(Life Science)		1.M.Sahalya, Bzc	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		2.K.Kalyani	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		3.Gousia Jaben	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		4.M.Anjali	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		5.E. Shravani	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	Applications of coordination compounds	B.Sc(Life Science)		1.Y.Shruthy	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	Chlorophyll	B.Sc(Life Science)		1.Sd.Thasneema	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		2. M. Meghana	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		3.P.Sriya	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		4.P.Anusha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		5.P.Saipriya	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	Crystal field theory	B.Sc(Life Science)		1. R.Alekhya	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		2.A.Ashwini	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		3.Asma Sulthana	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		4.M.Shravani	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		5.K.Nandini	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
		Amino acids	B.Sc(Life Science)		1.R.Deepika	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf

chemistry	Project work		B.Sc(Life Science)		2.V.Poojitha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		3.Ruqsar Begum	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		4.K. Ramya	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	The chemistry of garlic	B.Sc(Life Science)		1.K.Samatha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		2.K.Sahithya	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		3.M.Trishala	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		4.M.Sushmitha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		5.K.Archana	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	Common fruit acids	B.Sc(Life Science)		1.P.Akanksha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		2.V.Shivani	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		3.N.Akhila	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	Project on adverse effects with contents of soft drinks	B.Sc(Life Science)		1.P.Divya	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		2.B.Harika	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		3.M.Tejaswini	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		4.Nazra Uzma Fathima	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		5.K.Anusha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
chemistry	Project work	Hard and soft acids and bases	B.Sc(Life Science)		1.A.Mahanthi	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		2.A. Ashwini	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf

			B.Sc(Life Science)		3.A. Anusha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf
			B.Sc(Life Science)		4.B.Sangeetha	https://gdcts.cgg.gov.in//Uploads/files/Recent_Updates/109997.pdf

GOVT. DEGREE COLLEGE FOR WOMEN
Karimnagar

*** Department OF chemistry ***

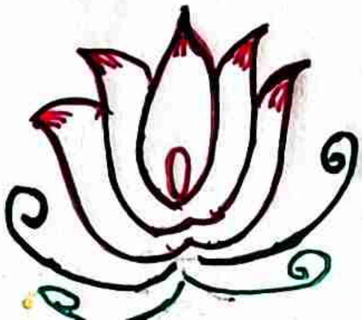
PROJECT REPORT

TOPIC :- Analysis of Fruits and Vegetable Juices for their Acidity.

Guided by :-

NAME:-
Dr. M. Prashanthi

Submited by :-
K. Ravali MPC 2nd year
B. SandhyaRani mpc 2nd year
A: Mahanthi mpc 2nd year
N. Anusha mpc 2nd year
farnaaz Zubeen 2nd year mpc



Analysis of Fruit & Vegetable juices for their acidity

Objective: To determine the amount of acids present in various fruits and vegetables and also to detect the presence of iron, carbohydrates, proteins and sugors in them

Requirements: Test tubes, burner, litmus paper, laboratory reagents, juices of various and vegetobles.

Theory: Fruits and vegetables are always a part of balanced diet. That means the fruits and vegetables provides our body the essential iron, carbohydrates, proteins, vitamins and minerals. Their presence in these substonces can be indicated by some general observations. For example, freshly cut apple become reddish after sometime because iron present in apple gets oxidised to iron oxide. However, the presence of iron, carbohydrates, proteins, acids and sugars can be tested in the laboratory by extracting their juices & subjecting them to various tests.

Procedure:

a) **Acid content:** Take different fruit juices in different containers and the pH paper in them. If pH is less tha 7, it is acidic. Determine their acid content by titrating a known quantity of a fruit juice with 0.01M KOH solution using phenolphthalein as indicator. In case of dark colored juices, dilute them with enough distilled water to get sharp end-point during titration. compare the acid contents of juices by compairing acid values. The acid value of vegetables and fruits is the number of milligrams of KOH required for neutralising acid present in one gram of vegetable or fruit.

6) **Test for iron:** Take 2ml of juice and add a drop of conc. nitric acid. Boil the solution, cool and add 2-3drops of potassium sulphocyanide solution. Appearance of blood red coloration indicates the presence of iron.

Test for carbohydrates: Take 2ml of juice and add 1ml of Fehling's solution A & B and boil it. Red precipitate indicates the presence of reducing sugars like maltose, glucose, fructose and lactose.

Test for Starch: Take 2ml of juice in a test tube and add a few drops of iodine solution. If it turns blue-black in color, it indicates the presence of starch.

Test for Calcium: Take 2ml of juice in a test tube & add a few drops of ammonium chloride & ammonium hydroxide solutions. Filter the solu^n & add 2ml of $(NH_4)_2C_2O_4$ solu^n. White precipitate indicates the presence of calcium.

Carbohydrates

1. Test with conc. H_2SO_4:

Take small quantity of carbohydrates in a test tube and add few drops of conc. H_2SO_4 solution.

a) If the compound undergoes charing in cold condition is glucose is confirmed.

b) If the compound undergoes charring in hot condition is fructose is confirmed

2. Molisch test:

Few drops of alcoholic alpha-napthol solution is added to 1-2ml aqueous solution of the compound and then conc. H_2SO_4 is added by keeping the test tube in inclined position. A deep violet colour ring is formed between the junction of two layers.

3. Benedict's test:

To 1-2ml aqueous solution of carbohydrate in a test tube add 1-2 ml of Benedict's reagent. Keep the test tube in a boiling water bath. Reddish ppt, indicates the presence of reducing sugar.

Proteins

Biuret test:

To the dispersion of the substance to be tested 5% solun and add about 2ml of NaOH solution. Now add 4-5 drops of 1% $CuSO_4$ solun. Warm the mixture for about five minutes.

Bluish violet coloration indicates the presence of protein.

2) Xanthsoproteic Test:

Take about 2ml of substance dispersion in a test tube and add few drops of ~~Nitric acid~~ = conc. HNO_3 solution. Boil the contents.

A yellow ppt. indicates the presence of proteins.

3) Ninhydrin Test:

Take about 2ml of substance albumin dispersion in a test tube. & add 3-4 drops of Ninhydrin solution. Boil the contents.

Test for Ferrous [Fe^{+2}] cation

1. To the salt solution Ammonium hydroxide soln NH_4OH is added	Dirty Green ppt. $Fe(OH)_2$ is formed	Fe^{+2} cation is confirmed
2. To the salt solun potassium ferrocyanate $K_4[Fe(CN)_6]$ solution is added	Deep blue ppt. $K_2Fe[Fe(CN)_6]$ is formed	Ferrous (Fe^{+2}) cation is confirmed

Test for Calcium [Ca^{2+}] cation.

1. To the salt solution Potassium chromate solution [K_2CrO_4] is added	Yellow colour ppt is confirmed Yellow colour solution $CaCrO_4$ is formed.	Calcium (Ca^{+2}) cation is confirmed
2. To the salt solution Ammonium Oxalate solution is added	White ppt. (CaC_2O_4) is formed. Above ppt. is insoluble in hot acetic acid	Calcium (Ca^{+2}) cation is confirmed

Government Degree college for Women Karimnagar

Department of chemistry

Student study Project

Topic :- The chemistry of watermelon

Name of Supervisor :- M. Prashanthi mam

Name of the student :-

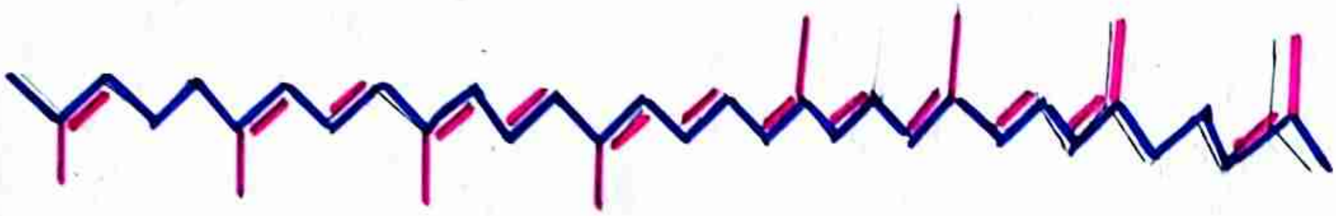
P. Swapna
Ruksar Begum
Keerthi Anusha
R. Nikhitha
M. Vineetha

Class :- II^nd year 4^th sem

Group :- Bsc (B+BC) & (MPC)

:- THE CHEMISTRY OF WATERMELON :-

:- COLOUR & AROMA :-



LYCOPENE

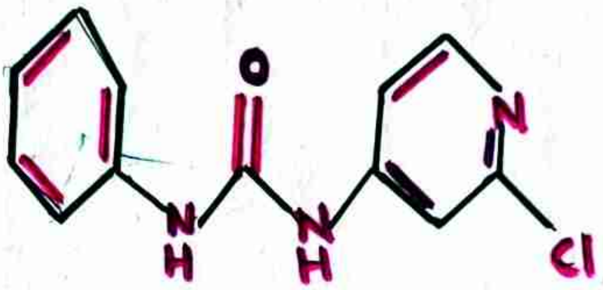
Pigment that causes watermelon's pink colour, also found in tamatoes

The Pink colouration of red watermelon flesh is due to the the presence of lycopene. This compound is also responsible for the colour of tamatoes, but it is found in even higher level in watermelon.

The aroma of watermelon is contributed to by a variety of chemicals generated by enzymatic oxidation of fatty acids when the water-melon is cut. The primary aroma-impact compounds are thought to be C_6 and C_9 aldehydes.

The aldehyde (z,z)-3,6-nonadienal is of particular significance and is often itself described as having a fresh, watermelon like odour. (z)-3,-hexenal, another aldehyde present, also contributes to the smell of fresh-cut grass.

EXPLODING WATERMELONS



FORCHLORFENURON

A growth:- Promoting chemical approved in the US for use on kiwi fruits, rasinis, and grapes, it is normally used in low quantities.

In 2011, farmers in eastern china were hit by a spate of exploding watermelons. This was a result of their treatment with forchlorfenuron, a plant growth regulator. Forchlorfenuron acts with plant auxins, naturaley present hormones that play an important role in plant growth, to promote cell division and growth. It was suggested that overuse of forchlorfenuron during wet weather resulted in the exploding watermelons, affecting an area of approximately 115 acres.

GDCW, KARIMNAGAR

Department of chemistry

Student Study Project

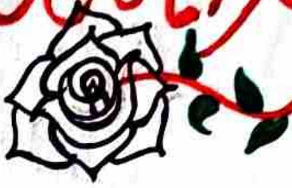
Topic - The chemistry of Plant flowering

Name of the Supervisor: Dr. M. Prashanthi maam

Submitted by : J. Supriya
A. Sravani
B. Vaishnavi
M. Mayuri
V. Saisharanya

class : BSc. BtBC
V Sem

The chemistry of plant flowering



Flowering plants are plants that bear flowers and fruits. Flowers are the reproductive Organs of flowering plants.

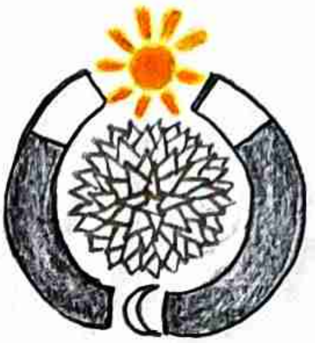
Main parts of a flower are sepals, petals, stamens and carpels. There are over 400,000 flowering plant species across the world.

What Triggers flowering?

Plant flowers when they detect environmental, such as changes in day length and temperature.

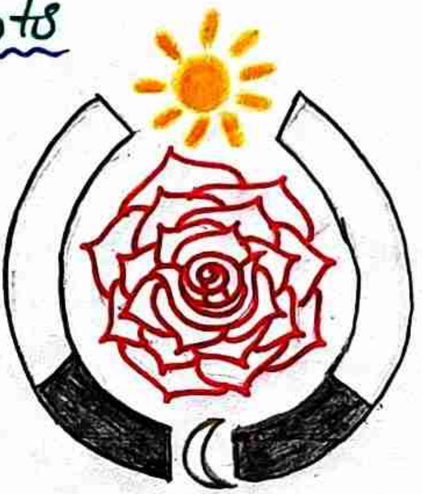
Short-Day plants

Flower when night time exceeds a certain length
E.g:- chrysanthemum.



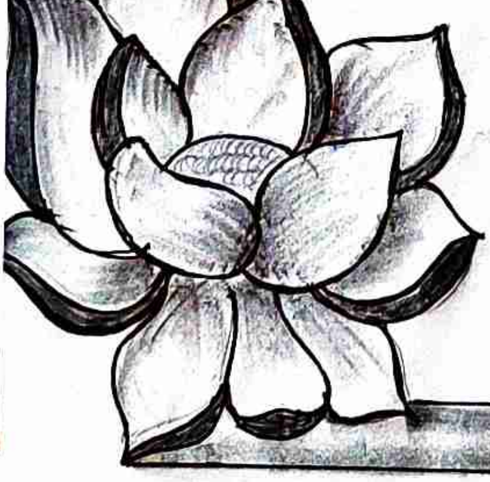
Long-Day plants

Flower when night time falls below a certain length.
E.g :- Rose.

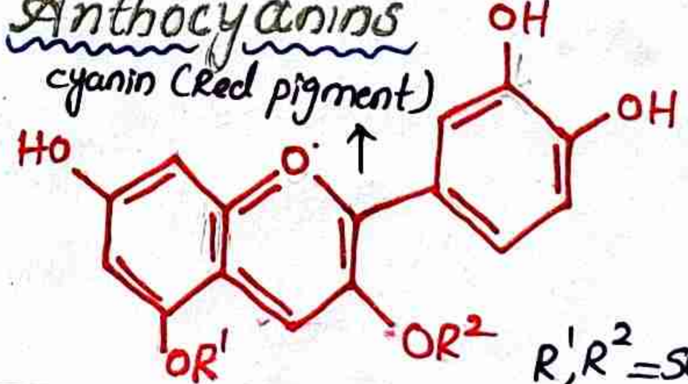


Flower pigments

A range of pigments gives flowers their diverse colours, but they all come from three pigment familis.



Anthocyanins



R^1, R^2 = Sugars.

Most red, blue, and purple flowers get their color from anthocyanins.

Carotenoids :-

zeaxanthin (yellow pigment)

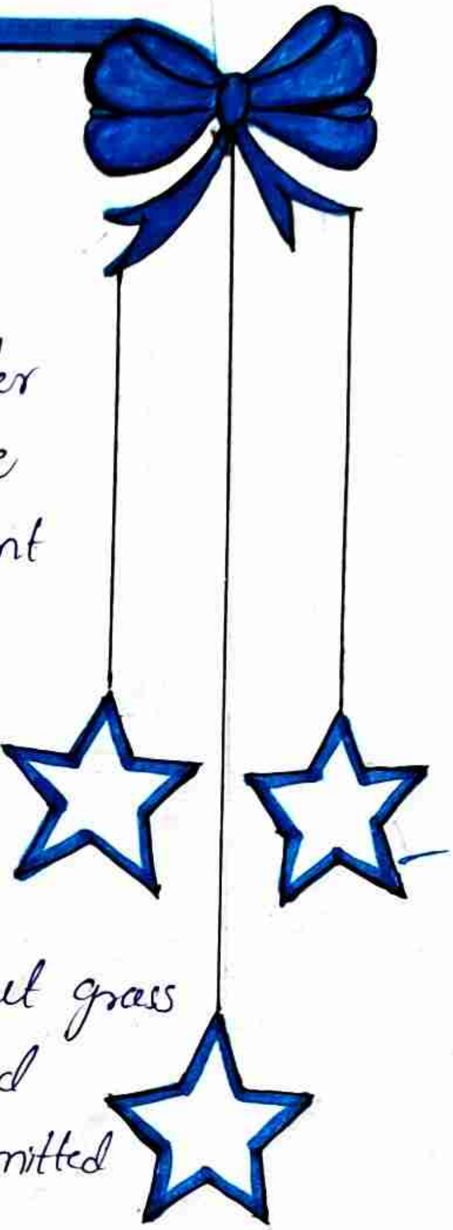
carotenoids are responsible for red to yellow hues in some flowers.

Betalains :-

Some flowers in the caryophyllales Order get their red and yellow colours from betalains.

Flower Aroma

Flower petals emit volatile Organic Compounds (VOCs) to deter herbivores and attract pollinators. These aroma compounds come from three key chemical classes.



Terpenoids :-

LINALOOL —

Contributes to the aroma of levender

enoids are derived from isoprene

d are often the most abundant

cs.

ree leaf volatiles

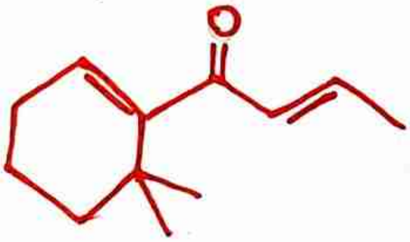
CIS-3-HEXENAL

Contributes to the smell of fresh-cut grass

ese compounds are also derived

om fatty acids and are also emitted by leaves.

phenylpropanoids



β - Damascone

contributes to the aroma of roses

These are a range of aromatic compounds synthesized from phenylalanine.

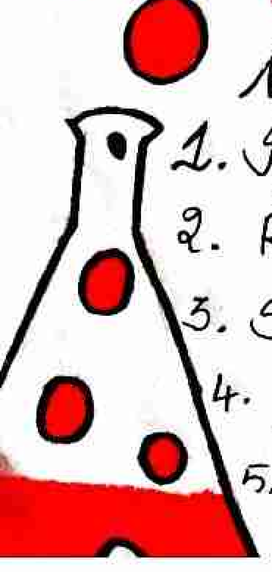
Government Degree College for Women's.
Karimnigar

Department of Chemistry

Topic:- Names of the Reagents in alphabetical order.

Name of the Supervisor:-

Dr. M. Prashanthi III sem



Names of the Students:-	Group:-
1. Iffath Unnisa Sabry	MbZC
2. Romana Raheem	BZC
3. Subia Tahreem	BZC
4. Zoha	MbZC
5. Madha-tul-Ifra	BtZC

Reagent : A reagent is a compound or mixture that is added to a system in order to initiate or test a chemical reaction. Because the binding of reagents triggers certain reactions to the substance or other related substance, reagents can be used to determine the presence or absence of a specific chemical substance.

S.no	Name of the Reagent	Formula	General Discription
1	Acetic Acid	CH_3COOH	An organic acid, one of the most basic carboxylic acids
2	Baeyer's reagent	$KMnO_4$	is an alkaline potassium permanganate solution, used in organic chemis as a qualitative-test for the presence of unsaturation, such as double bonds.
3	Chloroform	$CHCl_3$	chloroform is a common organic compound used as a solvent for NMR spectroscopy and as a general solvent

S.NO	NAME OF THE REAGENT	FORMULA	GENERAL DESCRIPTION
4	Diethyl ether	$(C_2H_5)_2O$	organic compound a common laboratory solvent
5	Ethanol	C_2H_5OH	a strong psycho-active drug that is used in alcoholic beverages, thermometers, as a solvent and as a fuel.
6	Fehling's reagent	CuH_2O_4S	used to distinguish water soluble aldehyde and ketone functional group.
7	Grignard's reagent	RMgX	The most common use is the alkylation of aldehydes & ketones
8	Hydrochloric acid	HCl	It is a highly corrosive, powerful mineral acid with numerous industrial applications
9	isopropyl alcohol	C_3H_8O	The most basic type of secondary alcohol, it dissolves a wide range of non-polar compounds.

S.No	NAME OF THE REAGENT	FORMULA	GENERAL DESCRIPTION
9	Lithium Aluminium hydride	$LIAlH_4$	A reducing agent used in organic synthesis to create the main group and transition metal hydrides from metal halides.
10	Millon's reagent	HgN_2O_6	A regent used in analysis to detect the presence of soluble proteins.
11	Nitric acid	HNO_3	A highly corrosive and toxic strong acid that is used in the production of fertilizers, explosives and as as component of aqua regia.
12	Osmium tetroxide	OsO_4	In organic synthesis, it is commonly used to convert alkenes to vicinal diols.
13	Pyridinuim chlorochromate	$C_5H_5NHClCrO_3$	Primary alchohols are oxidised to aldehydes and secondary alcohols are oxidised to ketones.

S No	NAME OF THE REAGENT	FORMULA	GENERAL DESCRIPTION
14	Raney nickel	—	An alternative catalyst for the hydrogenation of vegetable oils; used for desulphurisation in organic synthesis.
15	Sodium borohydride	$NaBH_4$	It is a multipurpose reducing agent that converts ketones and aldehydes to alcohols.
16	Tollen's reagent	$Ag(NH_3)_2OH$	A chemical test that determines whether a known carbonyl-containing compound is an aldehyde or a ketone.

Government Degree college Womens Karimnagar

Department of Chemistry

Student Study project

Topic :- "Cold medicines".

Name of the Supervisior :-

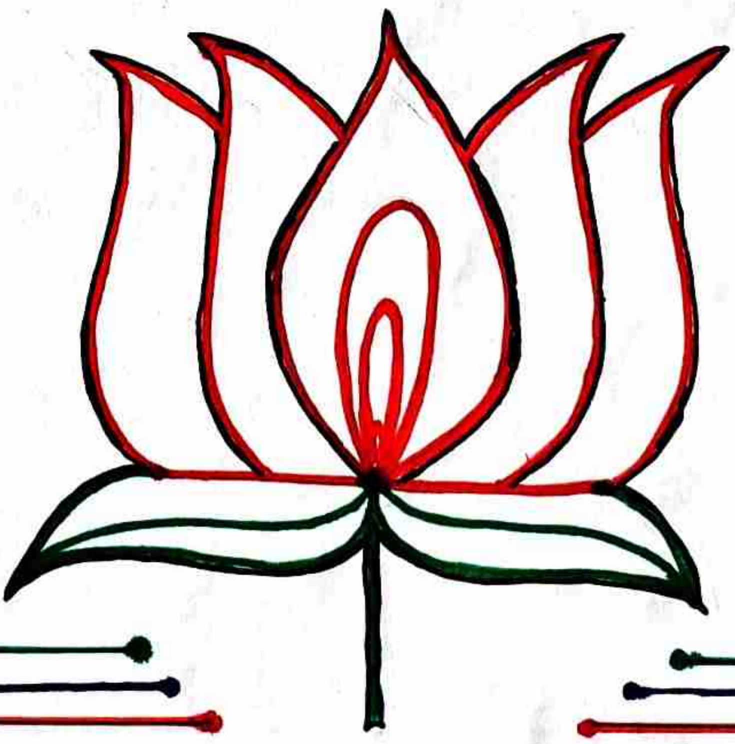
Dr. M. Prashanthi madam

Name of the Student

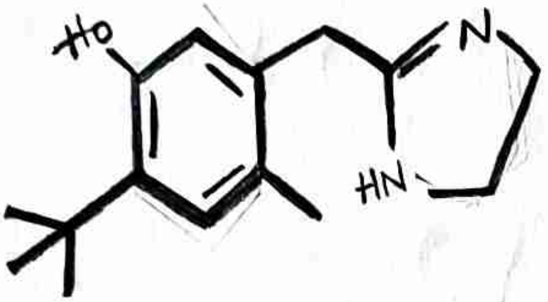
M. Prathyusha.

Group :- BSC . BZC.

THE CHEMISTRY OF COLD MEDICINES

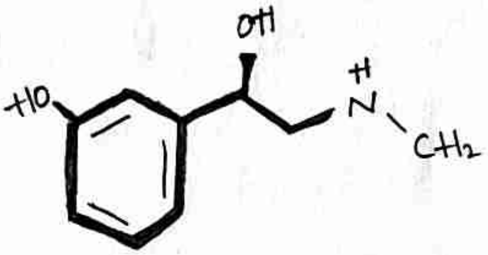


DECONGESTANTS

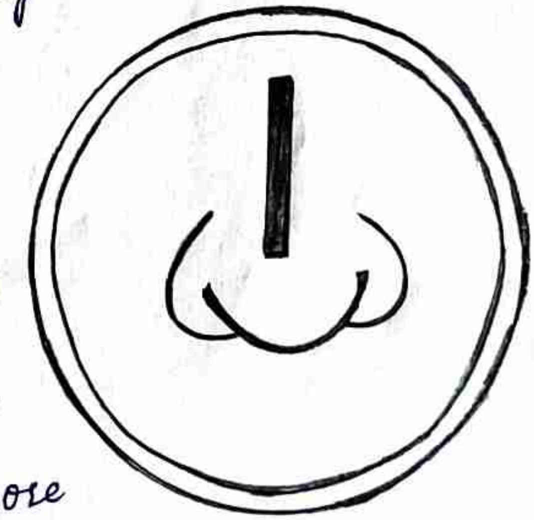


← OXYMETAZOLINE

PHENYLEPHRINE →

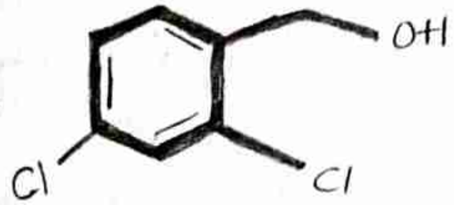


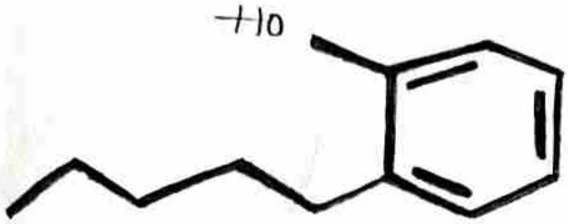
Decongestants ease a stuffed nose by reducing the Swelling of blood vessels around the Sinuses. phenylephrine is popular even though Scientists have questioned its efficacy. oxymetazoline is much more effective.



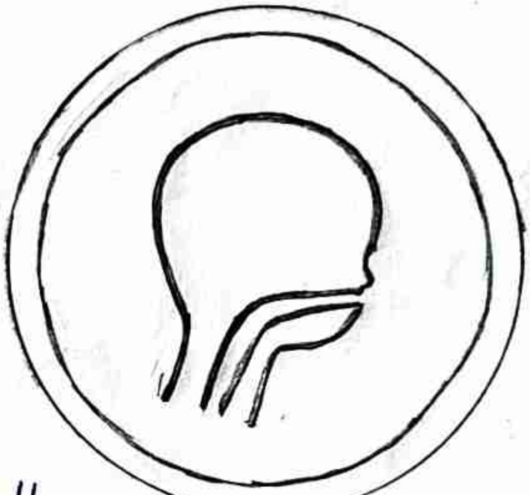
ANTISEPICS

DICHLORDUENZYL
-ALCOHOL →





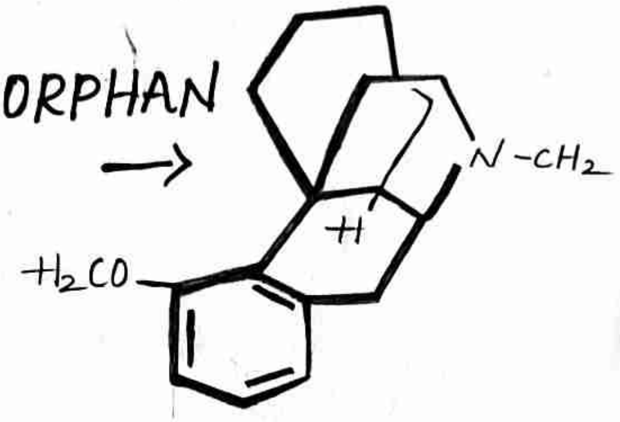
← AMYLMETACRESOL

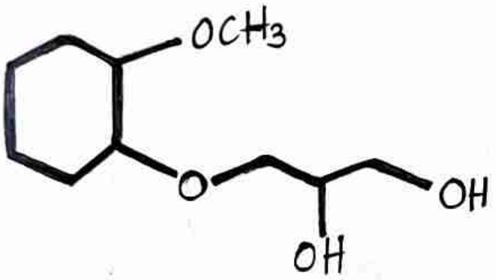


Many throat lozongos contain either dichlorobenzyl alchol or amylmetacresol or both in combination. They have an antiseptic effect. Soothing Sore throats. Evidence that they actually reduce the duration of throught infections is mixed.

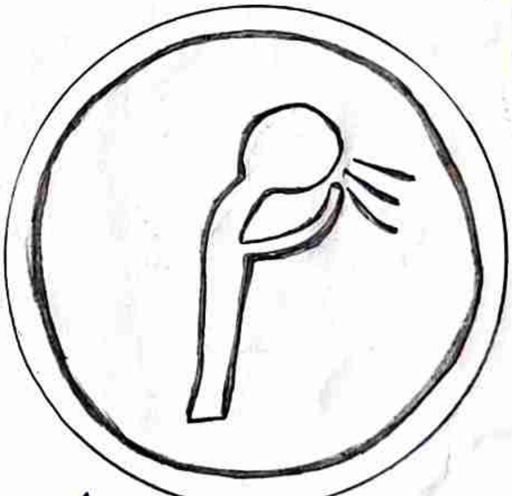
SUPRESSANTS / EXPECTORANTS

DEXTROMETHORPHAN →



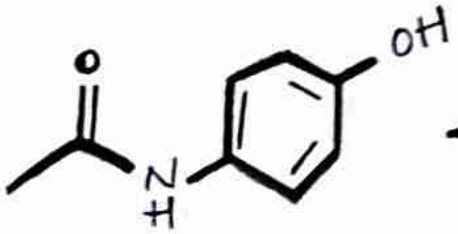


← GUAIFENESIN



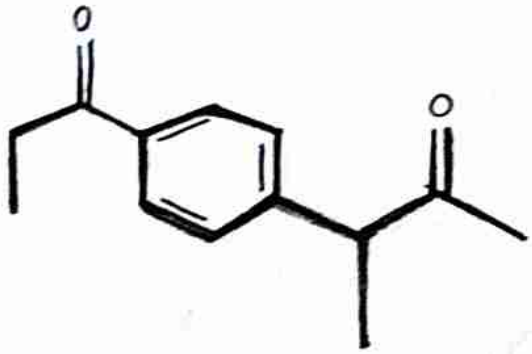
Dextromethorphan is an example of a cough Suppressant. Guaifenesin is an expectorant - a drug that helps bring up phlegm. Demulcents Such as glycerol. also found in cough medicines, coat the throat to ease irritation.

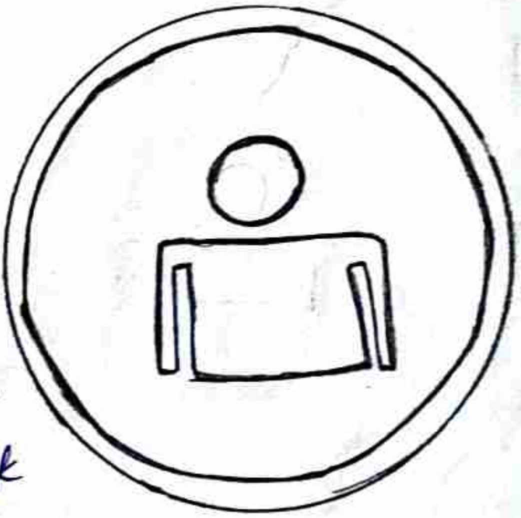
PAINKILLERS



← ACETAMINOPHEN

IBUPROFEN →





painkillers such as a acetaminophen (more commonly known by ts brand name Tylenol or aracetamol) and ibuprofen can help relieve inflammation. lthough exactly how they work is still unknown.

Government Degree College for Women Karimnagar

Department of chemistry

student study Project

Topic :- The chemistry of strawberries

Name of the Supervisor :- M.Prashanthi mam

Name of the student :- ch. Supraja-(B+BC) ★
R.Manasa-(B+BC)
B. Kalyani -(B+BC)
K.Rajeshwari-(B+BC)
Sowmya (BEBS)
Akhila (BEBS)

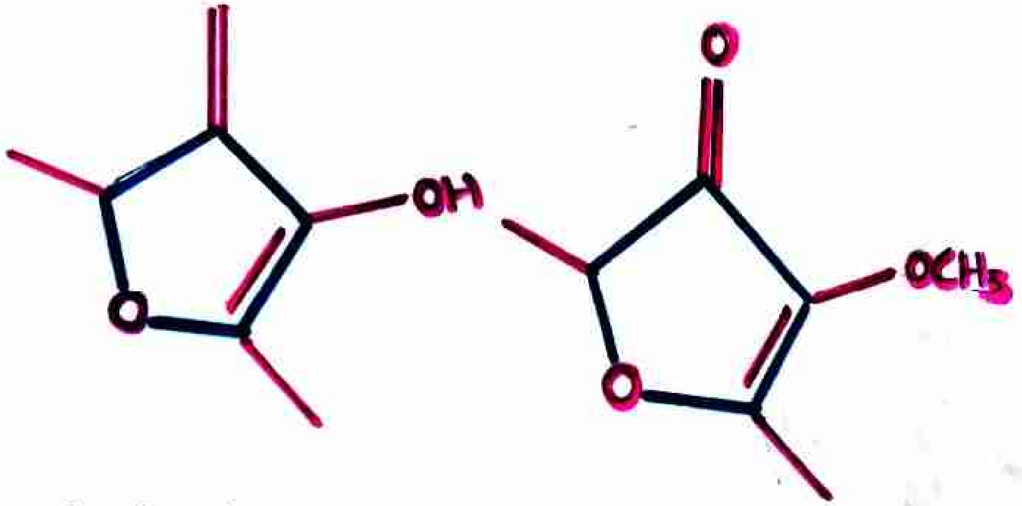
class :- IInd year

Group :- BSC (B+BC) 4th sem

THE CHEMISTRY OF STRAWBERRIES

Summer is here, so we're breaking out the strawberries and cream for dessert. Here, we dig into the compounds we have to thank for the aroma, color, and sweetness of this seedy fruit.

AROMA



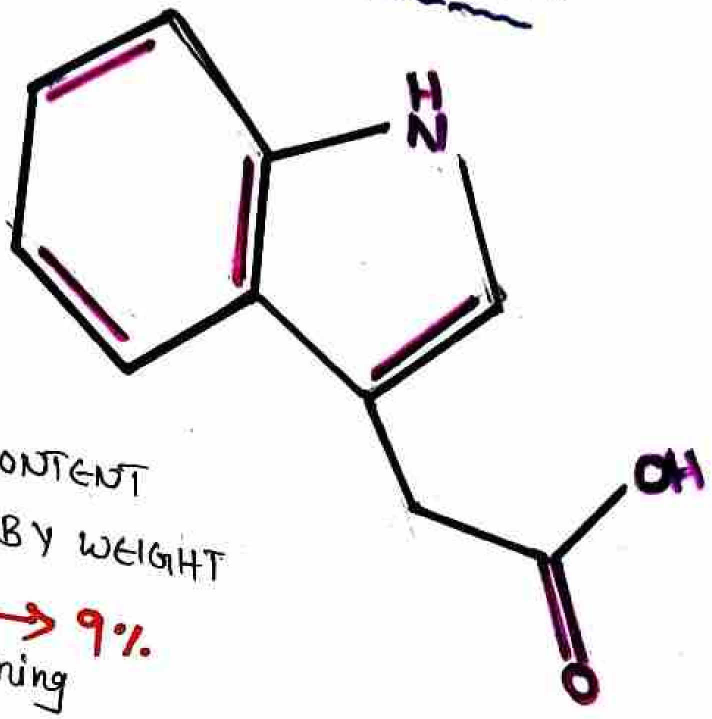
Two key molecules in the aroma of staberries are furaneol and methoxy furaneol. Their concentrations increase as the fruit ripens, reaching a maximum when it's fully ripe. Straberry-scented perfumes owe their aroma to pure furaneol.

÷ COLOR ÷

STRUCTURE OF ANTHOCYANIDINS (LEFT) & PELARGONIDIN 3. GLUCOSIDE (RIGHT)

Like many other fruits, strawberries get their color from anthocyanins. These compounds come from the addition of a molecule called an anthocyanidin to a sugar. The major anthocyanin present strawberries is pelargonidin 3-glucoside.

:- SWEETNESS & RIPENING :-



SUGAR CONTENT
INCREASE BY WEIGHT
5% ⟶ 9%
Ripening

RIGHT:- INDOLE-3-ACETIC ACID (The most Abundant Plant Auxin)

A variety of compounds contribute to a strawberry's flavor, with sweetness and acidity playing a major role. Sweetness develops as the strawberries ripen, a process driven by auxin hormones. Acidity, primarily from citric driven by auxin hor acid, decreases the ripening process.

Government Degree College for Women's
Karimnagar

Department of Chemistry
Student Study Project

Topic: Catalyst, characterstics of a Catalyst, types of Catalyst

Name of the Supervisor.
Dr. M Prasharthi

Name of the Student :- Sumayya Afreen. 5123
Group: B.S.C (B.ZC) E/M II year IV Sem.
Syeda Ayesha fatima 5126
Zareena Begum 5131
T. pooja 5127
S. Rohini 5124

Catalyst ;— A catalyst is a substance that speeds up chemical reaction, or lowers the temperature or Pressure needed to start one, without itself being Consumed during the reaction.
Catalysis is the process of adding a catalyst to Facilitate a reaction.

Characteristics of a catalyst ;— Catalyst activity is Maximum a Optimum temperature. Catalyst lowers the activation energy of Forward and Backward reaction and also lowers threshold energy. it provides a new mechanism for the reaction. it does not change the energy and extent of reaction.

3 types of catalyst ;—

- Homogeneous catalysis
- Heterogeneous catalysis
- Autocatalysis

Catalyst is a common word that you might come across while studying chemistry especially while learning about chemical reactions.

Process	catalyst
Ammonia Synthesis	Iron
Sulfuric acid manufacture	nitrogen (II) oxide platinum
Cracking of petroleum	Zeolites
hydrogenation of unsaturated hydrocarbons.	nickel, platinum, or palladium.

What is catalyst in chemistry :- In chemistry, catalyst are defined as those substance which alter the rate of reaction by changing the path of reaction. Most of the time a catalyst is used to speed up or increase the rate of the reaction. However, if we go to a deeper level, catalysts are used to break or rebuild the chemical bonds between the atoms which are present in the molecules of different elements or compounds.

- A catalyst does not initiate a chemical reation
- A catalyst does not be consumed in the reaction

Types of catalysts with Examples:-

There are several-types of catalyst that can be used depending on the need or requirement of the chemical reaction.

Positive catalyst:- catalyst that increase the rate of a chemical reaction are positive catalyst. it increases the rate of reaction by lowering the activation energy Barriers such that a large number of reaction molecules are converted into products, thereby the percentage of yeild of Ammonia in spite of less reaction of Nitrogen.

Negative catalysts:- catalyst that decrease the rate of reaction and negative catalyst. it decreases the rate of reaction by increasing the activation energy barrier which decreases the number of reactant molecules to transform into products and the rate of reaction decreases

Negative catalyst:- Decomposition of hydrogen peroxide into water.

Decomposition of hydrogen per oxide.

- catalysts tend to react with reactents to form intermediates and at the same time facilitate the production of the final reaction product. After the whole process,
- A catalyst can be either solid, liquid or gaseous catalyst. Some of the solid catalyst. some include metals or their oxides, including sulphides, and halides. Semimetalic elements such as Boron, aluminium. and silicon are also used as catalyst. likewise, liquid and gaseous elements which are in pure form are used as catalyst. sometimes these elements are also used along with suitable solvents or carriers.

Chemical reaction between the catalyst and a react This result in the formation of chemical of chemical intermediates that can further react quite readily with each other or with another reactant to form a product However when the reaction between the chemical intermediates and the reactants occurs or takes place the catalyst is regenarated

For solid catalysts. the reaction mechanism is greatly influenced by surface properties and electronic or crystal structures. Some types of solid catalysts such as poly functional catalysts can have several reaction modes with the reactants

Preparation of Ammonia by hyber's process :-

Pure and dry nitrogen and hydrogen gases in 1-to 8 ratio are passed through a compressor there high pressure of 200-30 atomosphere is set in this process, iron oxide is used as a catalyst.. it is a solid oxide employed in a process where the reactants are in gaseous state. the nitrogen (g) reacts with hydrogen (g) to form Ammonia (g). in the pressure of iron oxide solid thus it is heterogenous catalysis

Manufacture of sulphuric acid by contand process

in this process, the oxidation of sulphur dioxide is a major step. in this oxidation, sulphur dioxide is a gas and oxygen is a gas while vanadium pentoxide is a solid catalyst. in this process, reactants and catalyst are in different states matter.

Mechanism of heterogeneous catalyst :- heterogenous catalyst involves both adsorption.

Electrocatalysis:-

1- hydrolysis of ethyl acetate in the presence of dilute acid

ethyl acetate is a liquid that comes an ester functional group. it reacts with water in the presence of dilute sulphuric acid which is a liquid to give ethyl alcohol and acetic acid.

$$CH_3COOC_2H_5 + H_2Ocl \xrightarrow{H\oplus cl} CH_3COOCHC$$

In the above realion reactants and catalysts are in the same state of matters. hence, it is homogenous catalysis.

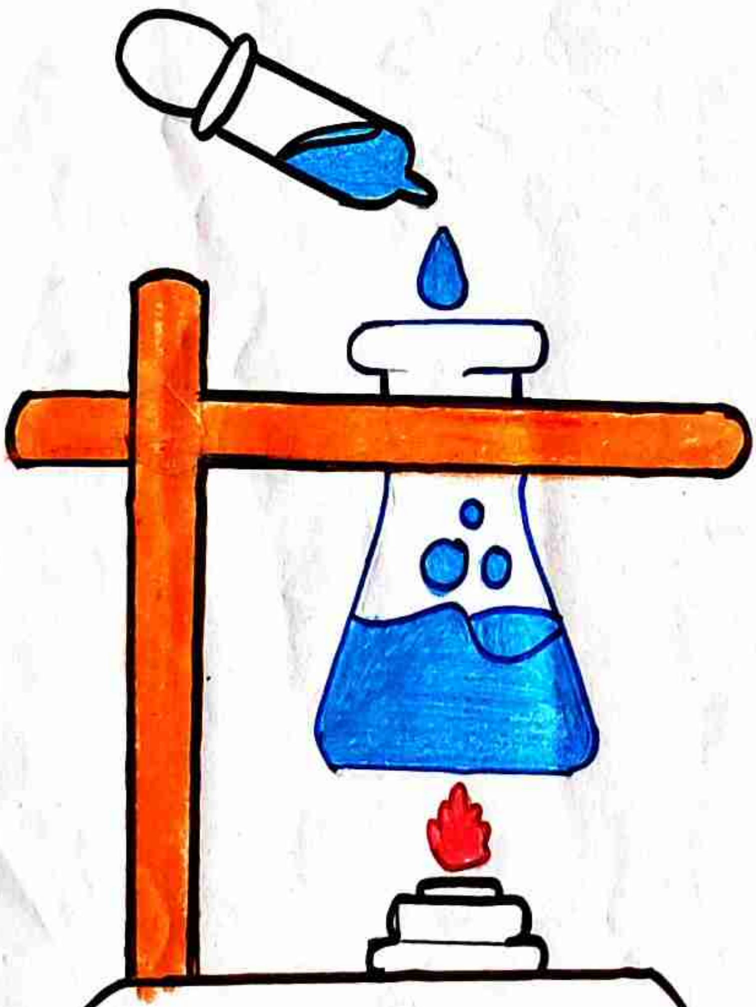
2- oxidation of sulphur dioxide in the lead chamber process:-

Lead chamber process is used in the manufacture of sulphuric acid. in this process nitric oxide gas is used as catalysis.

$$2SO_2(g) + O_2(g) \xrightarrow{NO(g)} 2SO_3(g)$$

Chemistry

Study project.



chemistry study project.

Government Degree college for womens.

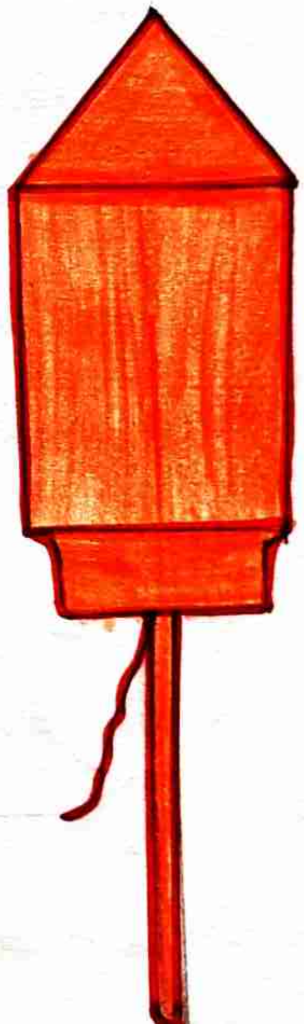
Student Study project

Department of Chemistry

Topic: Chemistry of Fireworks.

Name of Supervisor: Dr. M. Prashanthi., IV Sem
Name of students/group:
1> Zuha (MBZC)
2> Iffath Unnisa Sabry (MBZC)
3> Subia Tehreem (BZC)
4) Madiha Tul Ifra (BtZC)
5) Romana Raheem. (BZC)
6) K. Ananya (BtZC)
7) B. Jyotsna (BtZC)
8) Ayesha (BtZC)

Department of Chemistry



CHEMISTRY OF FIREWORKS.

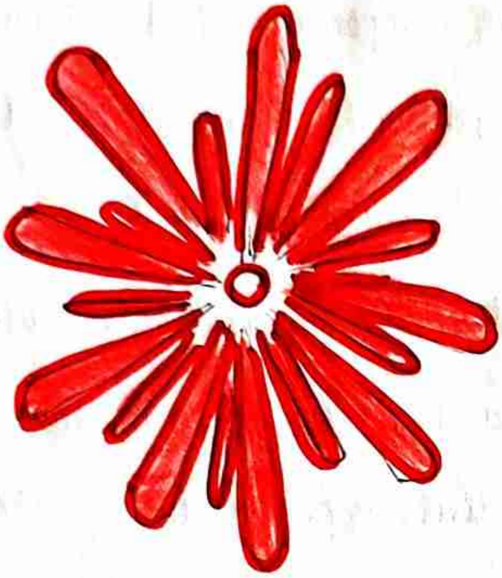
Fireworks are composed of four main components : fuel, oxidizer, binders and colouring agents. Gun powder acts as both the fuel and the oxidizer for fireworks. It consists of potassium nitrate, sulphur and charcoal. potassium nitrate is the oxidizer for gun powder because it will decompose at high temperatures and release oxygen. This allows the gun powder to combust without direct exposure to the atmosphere The sulphur will undergo exothermic reactions which continually releases heat into the mixture after ignition. charcoal is material that will act as fuel in combustion reaction.

Oxygen (potassium Nitrate), feul (charcoal) and heat (sulphur).

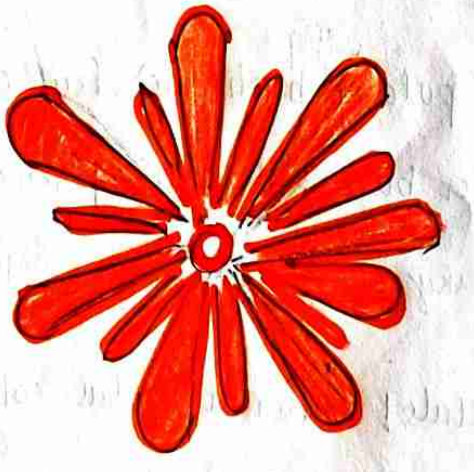
- gunpowder burns, it violently releases gas which propels the fireworks into the sky.

Metals ! Different metal colourants are added to fireworks depending on desired colours. metals are perfect for this application because they are stable and have discrete energy gaps.

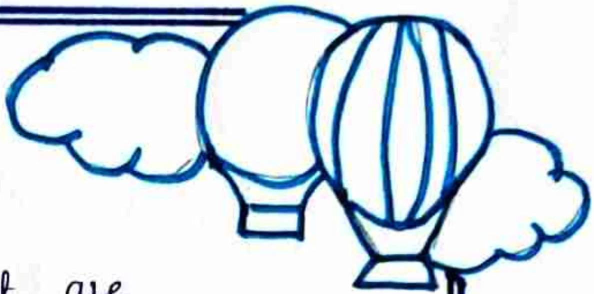
As metals are exited by the energy released from the combustion reaction, their valence electrons enter an excited state.



RED



ORANGE



As electron return to its ground state, excess energy is released as light. Different metals have different gaps that are proportional to a given wavelength in the visible light spectrum. For example strontium (Sr) releases red light, calcium (Ca) releases orgnge light and copper (Cu) releases blue light. Other metals such as sodium (Na), magnesium (Mg) and Barium (Ba) are used for other colours.

Basics of pyrotechnics / Fireworks.

1. oxygen source (oxidizer) + electron source (fuel)

$$\downarrow$$

products + Energy

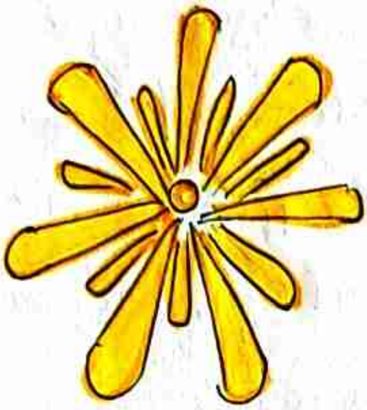
2. Energy output = light, color, sound, pressure, motion &'c'

The 'effect'.

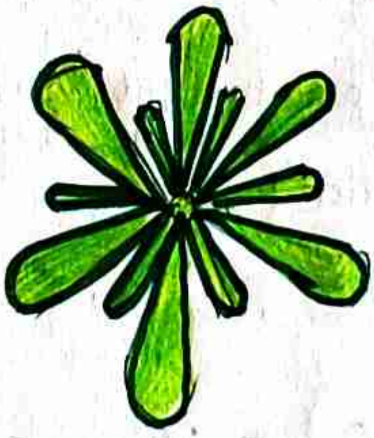
Electron Transfer - Redox.

$$3KClO_4 + 8Al \longrightarrow 3KCl + 4Al_2O_3$$

oxidizer - potassium percholate.



YELLOW



GREEN

Fuel- aluminum metal

3(138.5) : 8(27) = 66:34 parts by wt. for stoichiometric oxygen balance

aluminum is oxidised and the chlorine is reduced

This is classic "flash powder" formula.

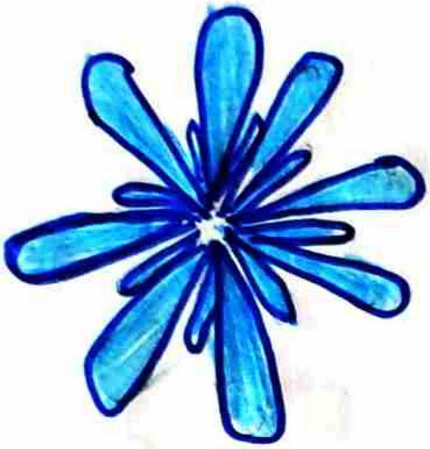
Ingredients for pyrotechnic Mixtures.

- oxidizing agents (oxygen-rich occasionally fluorine is used).
- fuels (organic, metallic, other)
- color ingredient
- Intensifier
- Binder (small %) - can also act as a fuel.

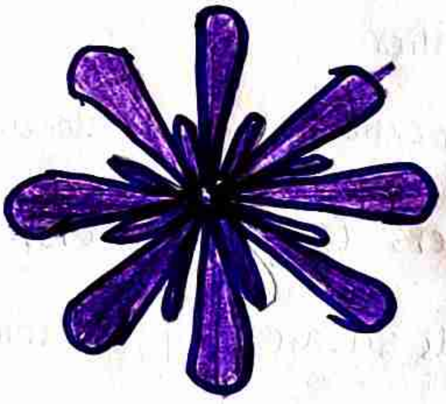
Oxidizers (oxygen donors).

chemicals release oxygen atoms when heated to elevated temperatures. oxygen reacts with a fuel to produce energy/heat.

- potassium nitrate, KNO_3, saltpeter
- potassium percholate $KClO_4$
- strontium nitrate, $Sr(NO_3)_2$ (red flame color)
- Barium nitrate $Ba(NO_3)_2$ (green colour flame)
- Amomonium perchlolate NH_4ClO_4. Teflon $(C_2F_4)_n$ fluorine oxidizer



Blue



purple

Fuels: these chemicals are oxidised or burned by the oxygen released by the oxidizer, producing heat.

- metal powders (high heat output): Al, mg, Mg/Al alloy (magnalium). Fe, Ti

Elemental fuels: C (charcoal), S, P (watch out).

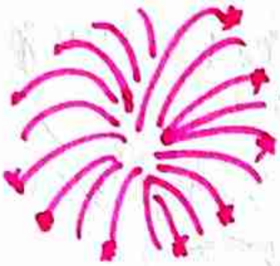
carbon/hydrogen "organic compounds": straches, sugars, p (watch out) plastics (PVC) tree gums and resins.

Ignition: Reach a temperature where the oxidizer is releasing oxygen at a fast rate and fuel is activated to be able to accept the oxygen to produce oxidized products.- heat that is then released, propagating the reactions.

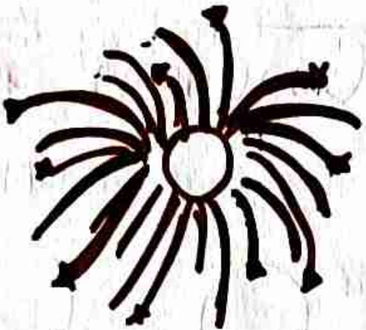
→ light a small proportion, and rest goes proof.

- possible Ignition sources - flame, friction, impact, spark, elevated temperature, chemical incompatibility

Other factors: chemistry alone doesn't govern fireworks! Extent of mining, purity of starting chemicals. - particle sizes, - Degree of confinement - Effect of water. Form - powder, pellet, pressed into a tube.

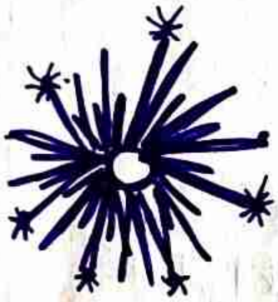


pink: lithium (li)

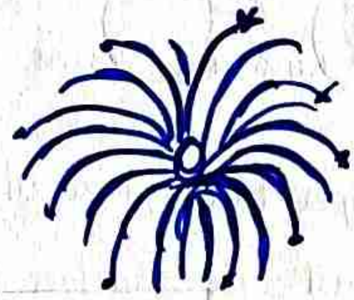


Gold: Iron (Fe)

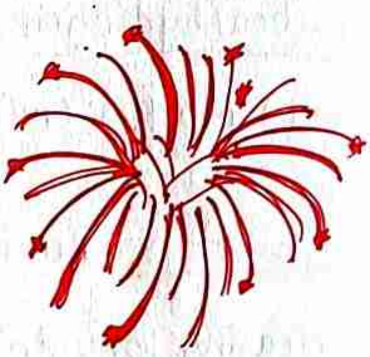
Green: Bariu



purple: copper (cu) &
Strontium (Sr)

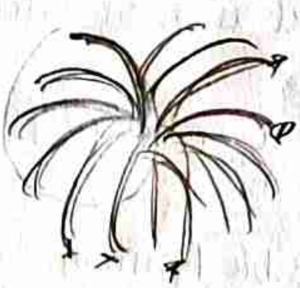


Blue: copper (cu)



Red: Strontium

Yellow
(Na) Sodium



Silver: Aluminium (Al)
Titanium (Ti)
& Magnesium (mg)

The Original Firework : Black powder.

potassium nitrate, KNO_3	75 pts by wt
charcoal, C	15 pts by wt
Sulphur S	10 pts by wt.

(potassium nitrate is hygroscopic, different forms of charcoal).

Pyrotechnics Used in Fireworks.

Fuse / Delay propellant, "lift charge". Burst charge

"Report" - a concussion/sound color/light (stars, sparks, strobe, crackle) whistle

smoke - sometimes wanted, sometimes not.

light processes:

, Atomic Emission (vapour) , Molecular Emission (vapour)

, Blackbody emission (solid/liquid).

Colours:

Red - strontium compounds

Orange - calcium compounds

Blue - copper compounds

Green - Barium or boron compounds

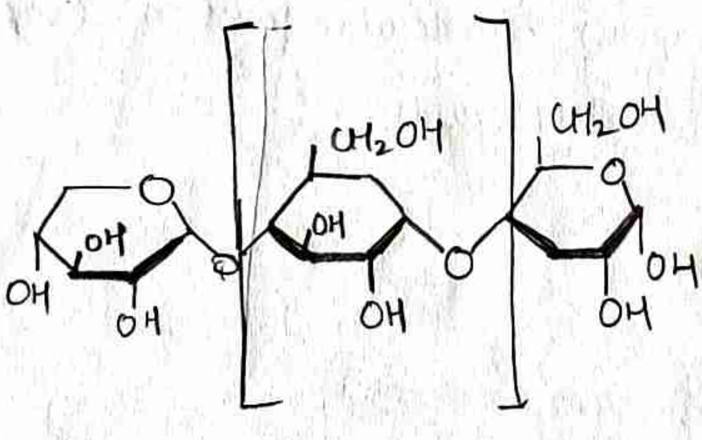
OXIDISER

NO_3^- Nitrates [All rounder, cheap]

ClO_3^- chlorates
powerful oxidizer, high
temperature
unstable

ClO_4^- perchlorates

BINDER



DEXTRIN.

Yellow: sodium atoms.

violet - strontium and copper

white - Aluminum or titanium metal (hot burns)

Colors and Mixing:

Various colours (wavelength of visible light) can be mixed to produce other colours.

Example: Red and blue produce violet green and orange produce Yellow.

FIREWORKS BANGS, CRACKLES, WHISTLES.

- colour of fireworks get a lot of attention when it comes to explaining the chemistry behind them. However there's alot of chemistry behind the assorted noises that fireworks make. Here we take Brief look at what causes the bangs, crackles and whistles in fireworks displays.

HEATS OF REACTION- HIGH HEAT OUTPUT ENHANCES LIGHT OUTPUT.

$KClO_4$/Mg	− 2.24 K cal/g
$NaNO_3$/Mg/polyester	− 2.0
Black powder (KNO_3/S/C)	− 0.66.

FIREWORK BANGS.

oxidiser $KClO_3$ + SULPHUR + METAL usually Al

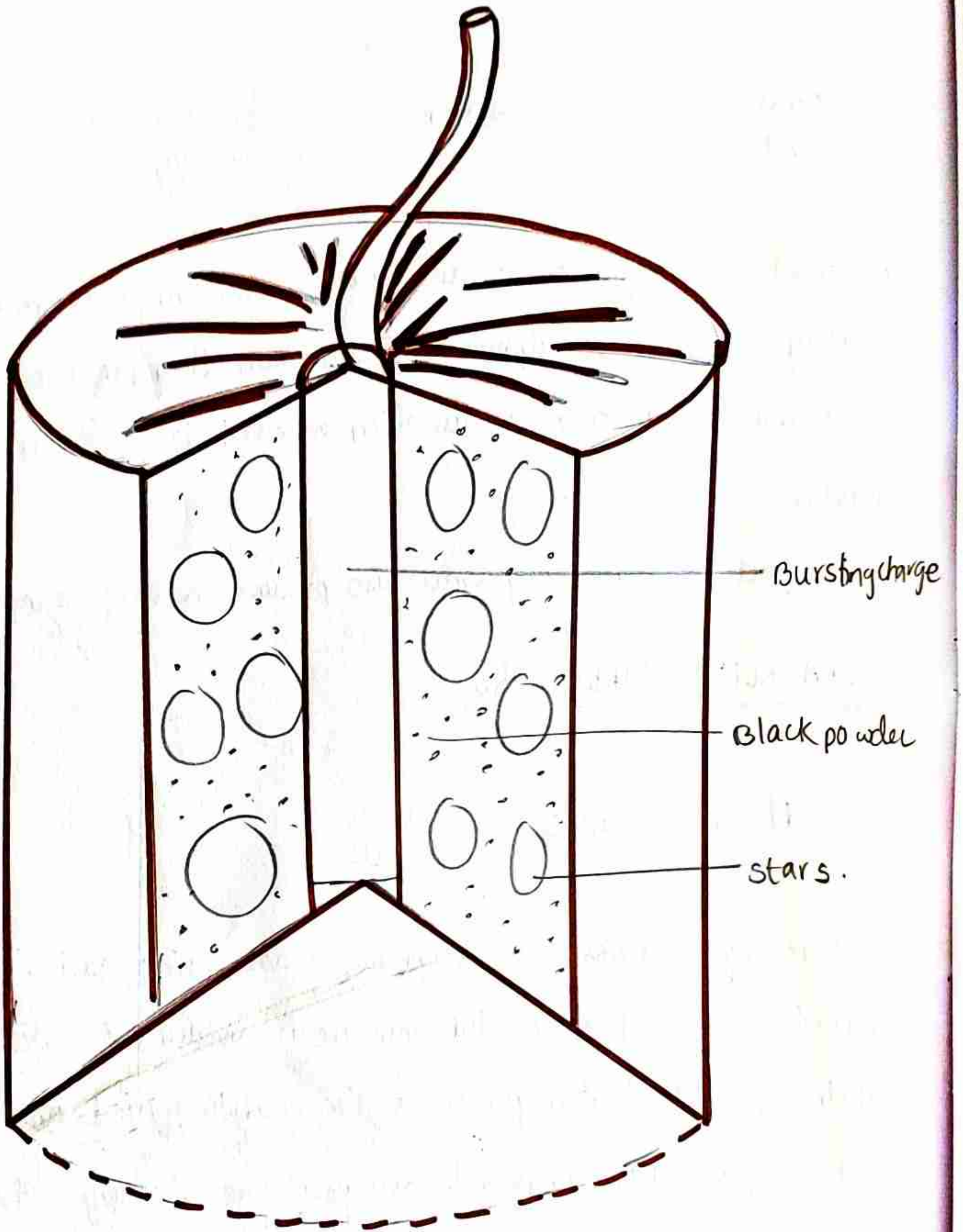
produced by the ignition of an explosive mixture of compounds usually an oxidiser, sulphur, and aluminum. they produce a flash of light and a loud bang. so are often refered to as "flash and sound" mixtures.

" compacted, confined gunpowder also produces a large bang."

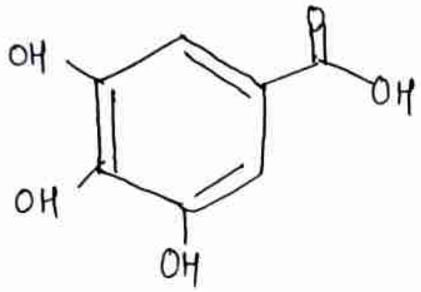
CRACKLING FIREWORKS.

Pb_3O_4 Bi_2O_3 $(BiO)_2CO_3$

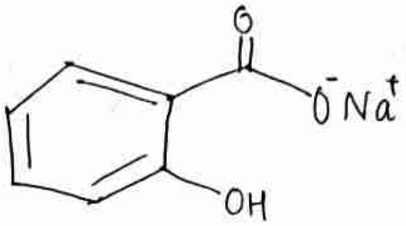
Crackling fireworks were originally made using lead tetroxide mixed with magnalium. the mixture is divided into small granules their rapid combustion produces the crackling effect. Due to lead's toxicity bismuth compounds are now more commonly used.


Burstingcharge
Black powder
stars.

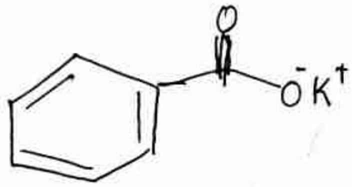
WHISTLING FIREWORKS.



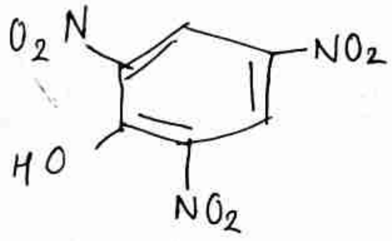
Gallic Acid



sodium salicylate.



Potassium Benzoate



picric acid.

these organic compounds are mixed with oxidizers (e.g) potassium percholate and tightly packed into a tube small exposions caused by aromatic compounds lead to ossilations in gases created by the burning mixtures. This creates a standing wave in the tube, producing a whistle effect.

Govt. Degree College (W)
Karimnagar

CHEMISTRY STUDENT STUDY PROJECT

on

AMINO ACIDS

Name of the Supervisor : Dr. Prashanthi Madam

Name of the students : Nousheen Fatima
Lubna fiza
Mahenoor

Group : BSc BZC IV Sem

Government Degree college for womens

Department of Chemistry

:- student study Project :-

- Topic :- Amino Acids - Properties

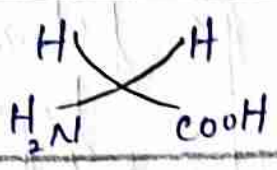
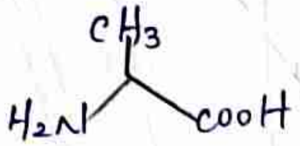
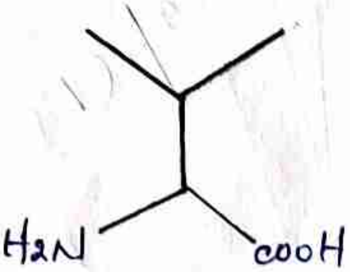
* Name of the Supervisor :-
Dr. M. Prashanthi

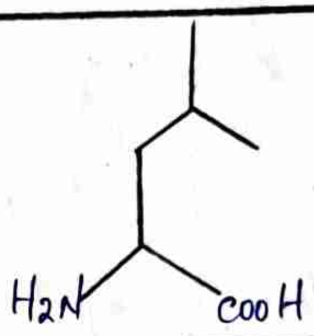
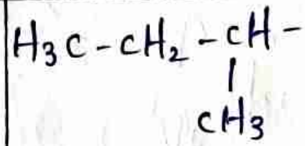
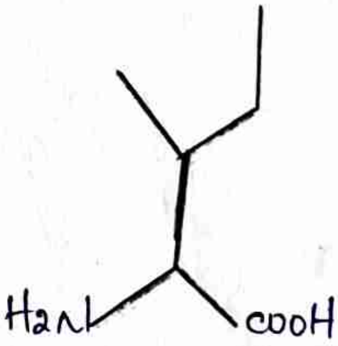
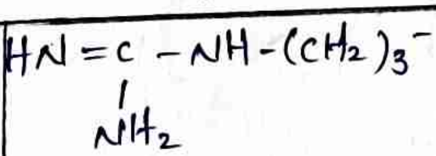
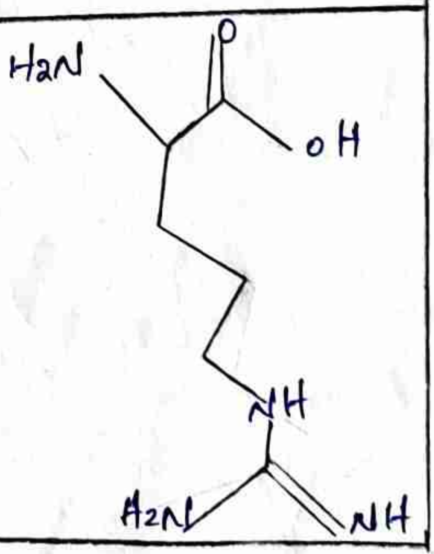
Name of the students :- 1) Nousheen fathima
2) Mahenoor
3) Lubna Fiza

Group :- B.S.C B.Z.C E/M. 2nd year. (IV)

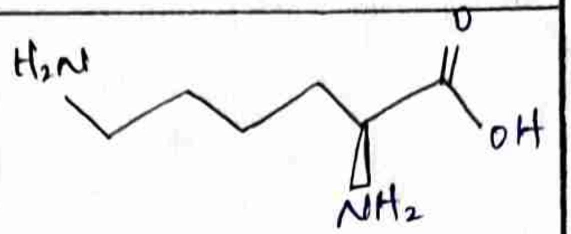
*:- Amino Acids and their Importance :-

Amino acids are molecules that combine to form protiens. Amino acids and Protiens are the building blocks of life. when protiens are digested or broken down, amino acids are left. The human body uses amino acids, to make protiens to help the body and break down food.

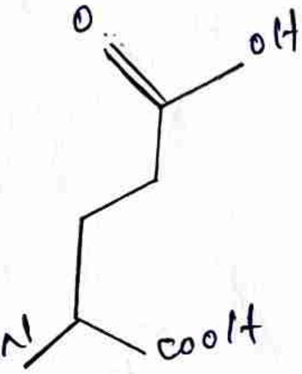
<table>
<tr><th></th><th>Name of the amine acid</th><th>characteristic feature of side chain R</th><th>structure</th></tr>
<tr><td>1</td><td>Glycine</td><td>H</td><td></td></tr>
<tr><td></td><td colspan="3">• Three letter symbol :- Gly
• use :- Glycine is an amino acid that your body uses to create protiens, which it needs for the growth and maintances of tissue and for making important substances, such as hormones and enzymes.</td></tr>
<tr><td>2</td><td>Alanine</td><td>$-CH_3$</td><td></td></tr>
<tr><td></td><td colspan="3">• Three letter symbol :- Ala
• use :- Alanine is an amino acid that is used to make Protiens, . it is used to break down tryptophan and vitamine B-6. It is a source of energy for muscles and the central nervous system.</td></tr>
<tr><td>3.</td><td>valine</td><td>$(H_2C)_2CH-$</td><td></td></tr>
<tr><td></td><td colspan="3">• Three letter symbol :- val
• use :- Valine is a branched chain amino acid and closely</td></tr>
</table>

<table>
<tr><td colspan="3">related to leucine and isoleucine in both structure and function. These three branched amino acids in our body comprised approximately to 70 percent of the aminoacids.</td></tr>
<tr><td>4 Leucine*</td><td>$(H_3C)_2CH-CH_2-$</td><td></td></tr>
<tr><td colspan="3">• Three letter symbol:= Leu
• use:= Leucine is an essential amino acids for protien synthesis. Additionally, similarly to other amino acids, the carbon skeleton of leucine can be used to generate ATP.</td></tr>
<tr><td>5 Isoleucine*</td><td> $H_3C-CH_2-\underset{CH_3}{\underset{|}{CH}}-$</td><td></td></tr>
<tr><td colspan="3">• Three letter symbol:= Ile
• use:= Isoleucine as one of the branched chain amino acids. is also critical in physiological functions of the whole body such as growth, immunity, protien, metabolism. fatty acid and glucose transporation.</td></tr>
<tr><td>6. Arginine*</td><td> $HN=\underset{NH_2}{\underset{|}{C}}-NH-(CH_2)_3-$</td><td></td></tr>
</table>

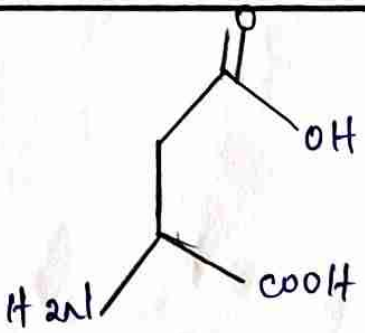
- Three letter symbol:- Arg
- use:- It is neccessary for making protiens and is commonly used for circulation.

7.	Lysine*	$H_2N-(CH_2)_4-$	

- Three letter symbol:- Lys
- use:- Lysine appears to help the body absorb calcium, and it plays an important role in the formation of collagen, a Substance important for bones and connective tissues including skin, tendons, and cartilage.

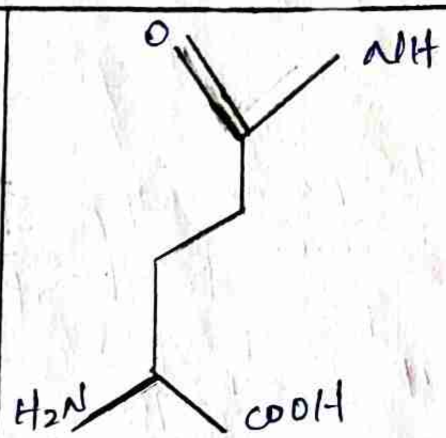
8.	Glutamic acid	$HOOC-CH_2-CH_2-$	

- Three letter symbol:- Glu
- use:- Glutamic acid is an amino acid used to form protiens. In the body it turns into glutamate. This is a chemical that helps nerve cells in the brain send and recieve information from other cells.

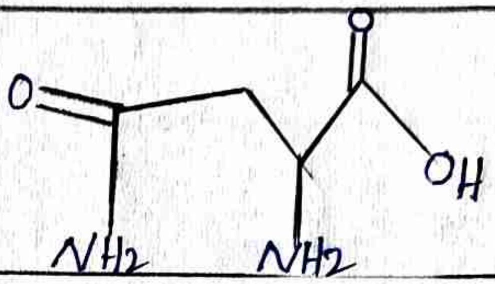
9.	Aspartic acid	$HOOC-CH_2-$	

- Three letter symbol:- Asp

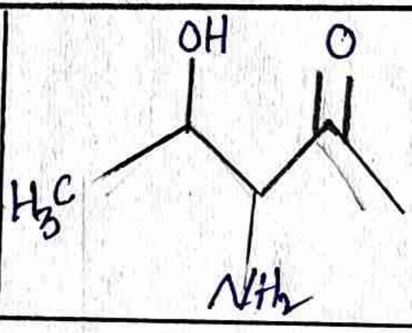
- use:= Aspartic acid helps every cell in the body work. It plays a role in Hormone production and release

10. Glutamine	$H_2N - \overset{O}{\overset{\|}{C}} - CH_2 - CH_2 -$	

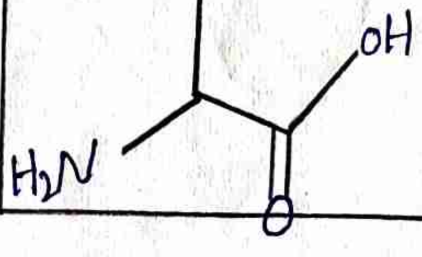
- Three letter symbol:= Gln
- use:= Glutamine is a building block for making protiens in the body. It is also needed to make other amino acids and glucose.

	Name of the amine acid	Characteristic feature of side chain R	Structure
1	asparagine		

- Three letter symbol:- ASN
- Use:- Asparagine is an alpha-amino acid in which one of the hydrogens attached to the alpha-carbon of glycine is substituted by a 2-amino-2-oxoethyl group. It has a role as a Daphnia magna metabolite and an algal metabolite.

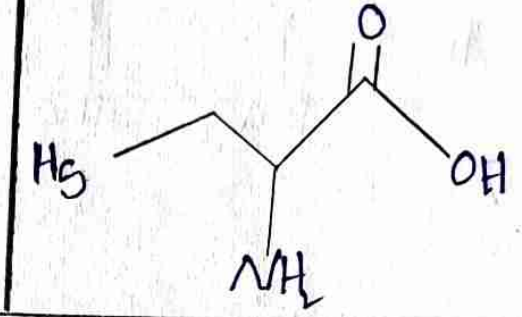
2.	threonine		

- Three letter symbol:- Thr
- Use:- Threonine mainly serves as a substrate for protein synthesis particularly mucin in addition Thr can enter the cababolic pathway where it can be metabolized to a variety of important products.

3	Serine		

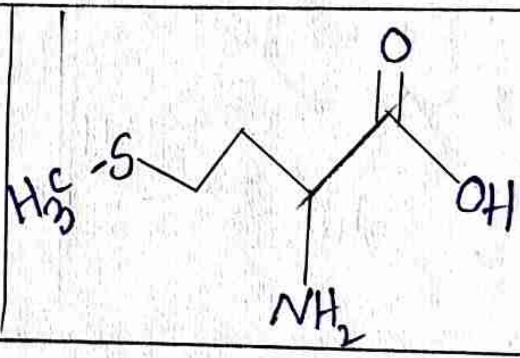
- Three letter Symbol:- Ser
- Use:- D-Serine is used for Schizophrenia Parkinson and memory and thinking skills many other conditions L-Serine is used to improve sleeping, lou Gehrig's disease conditions.

4 Cysteine



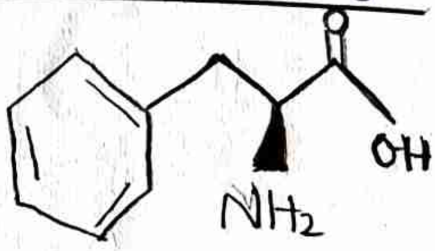
- Three letter Symbol:- SYS
- Use:- Cysteine is a non-essential amino acid important for making protein and for other metabolic function its found in beta-Keratin.

5. M

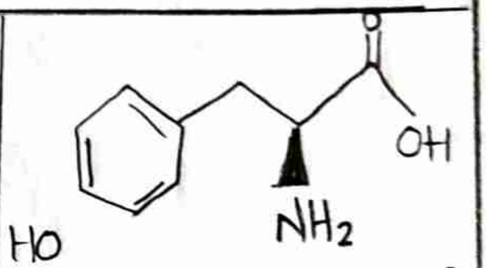


- Three letter Symbol:- Met
- Use:- Methionine is an antioxidant. It may help protect the body from damage caused by ionizing radiation. It may detoxify harmful substance in the body, such as heavy metals. It may also prevent liver damage from acetaminophen poisoning.

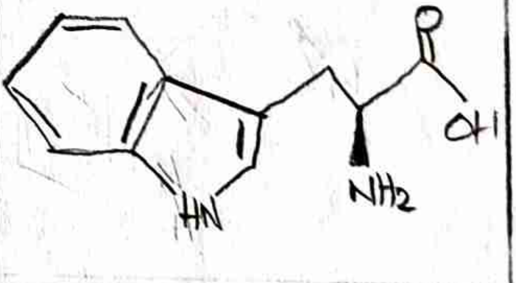
16. Phenylanlanine



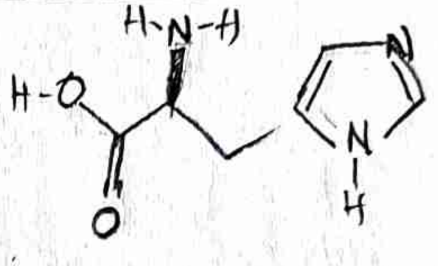
Three letter symbol:- Phe
uses:- Phenylalanine is most commonly used for a skin disorder that cause white patches to develop on the skin (vitiligo). It also used for aging skin, pain, obesity, and many other conditions, but there is no good scientific evidence to support these uses.

7. Tyrosine-		

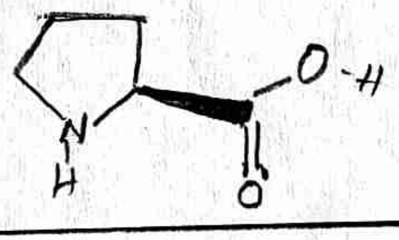
Three letter symbol:- Tyr
uses:- Neurotransmitters help nerve cells. communicate and influence mood. Tyrosine also help produce melanin the pigment responsible for hair and skin color. It helps in the function of organs responsible for making and regulathing hormones, including the adrenal, thyroid, and pituitary glands.

8 Tryptophan		

· Three letter symbol :- TrP
uses:- The body uses tryptophan to help make melatonin and serotonin. melatonin and serotonin. melatonin helps regulate the sleep-wake cycle, and serotonin is thonght to help regulate appetite, sleep, mood, and pain.

Histidine		

three letter symbol:- His
usese:- pepole use histidine as medicine. some pepole take histidine by mouth for metabolic syndrome, diarrhea caused by cholera, infection caused by kidney failure or kidney dialysis.

proline		

Three letter symbols - Pro
uses :- the body uses proline to make proteins, such as collagen. collagen is found in the skin, bones, and joints, proline is also involved in the general function of cell

Government Degree college
Womens Karimnagar

Department of chemistry.

Student Study Project

Topic :- Green chemistry

Name of the Supervisior :-

Dr. M. Prashanthi madam.

Name of the Student.

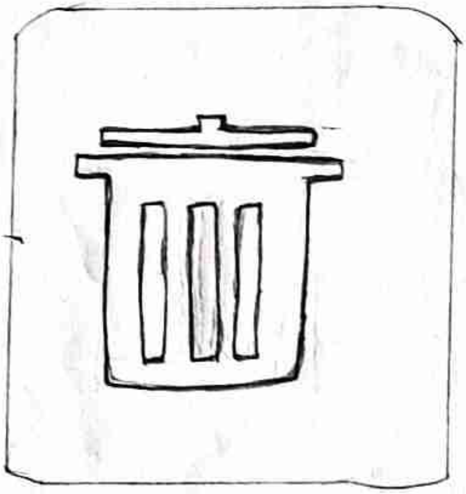
K. Ramya

Group :- MBZC (Bsc) II Sem

THE 12 PRINCIPLES OF GREEN CHEMISTRY

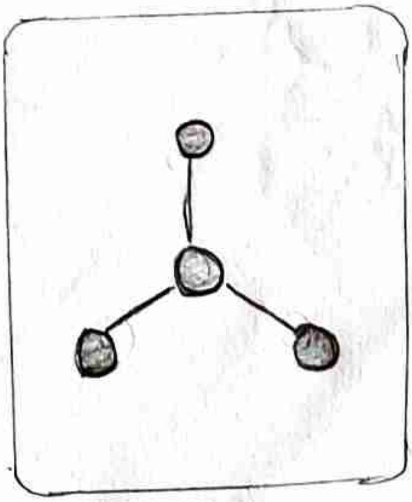
Green chemistry is an approach to chemistry that that aims to maximize efficiency and minimize hazardous effects on human health and the environment. While on reaction can be perfectly 'green', the overall negative impact of chemistry research and the chemical industry can be reduced by implementing of 12 principles of Green chemistry wherever possible.

1. Waste Prevention.



Prioritize the prevention of waste, rather than cleaning up and treating waste after it has been created. Plan ahead to minimize waste at every step.

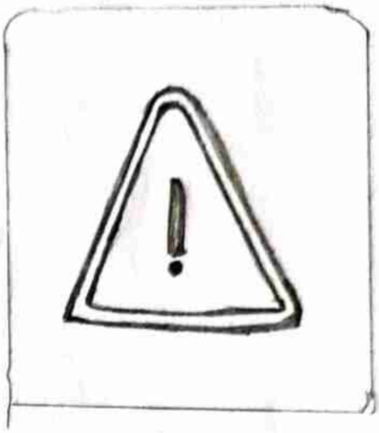
2. Atom Economy



Reduce waste at the molecular level by maximizing the number of atoms from all reagents that are incorporated into the final product. Use atom economy to evaluate reaction efficiency.

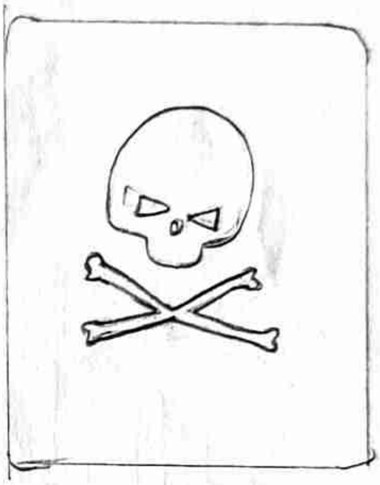
3. Less Hazardous chemical synthesis

Design chemical reactions and synthetic routes to be as safe as possible. consider the hazards of all substances handled during the reaction, including waste.



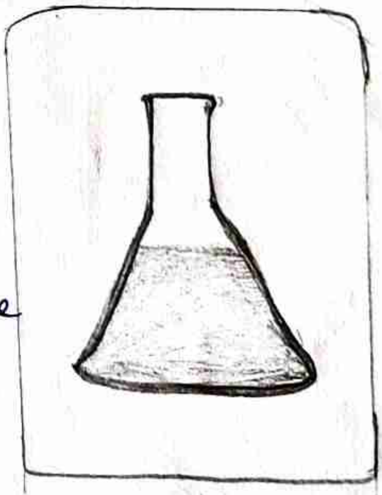
4. Designing safer chemicals

minimize toxicity directly by molecular design. Predict and evaluate aspects such as physical properties, toxicity, and environmental fate throughout the design. process.

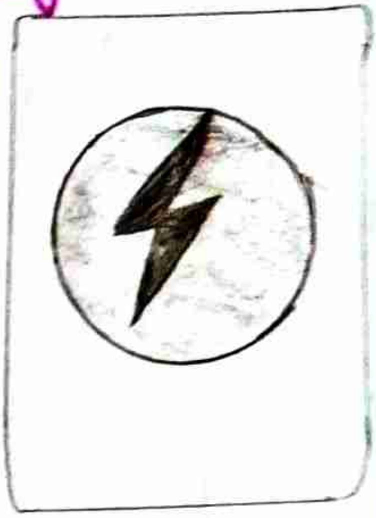


5. Safer solvents & Auxiliaries

choose the safest solvent available for any given step. minimize the total amount of solvents and auxiliary substances used, as these make up a large percentage of the total waste created.

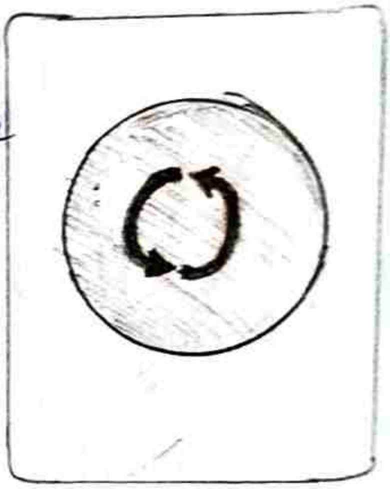


6. Design for energy efficiency



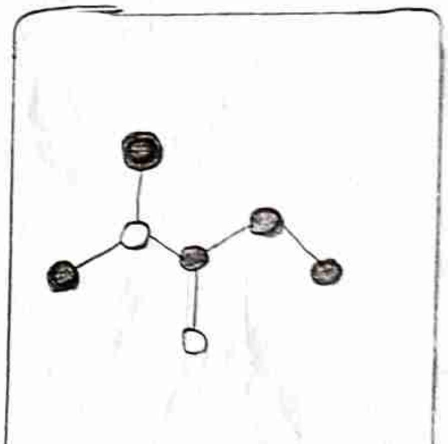
choose the least energy-intensive chemical route. Avoid heating and cooling, as well as pressurized and vacuum conditions (i.e. ambient temperature & pressure are optimal).

7. Use of Renewable Feeds Tocks



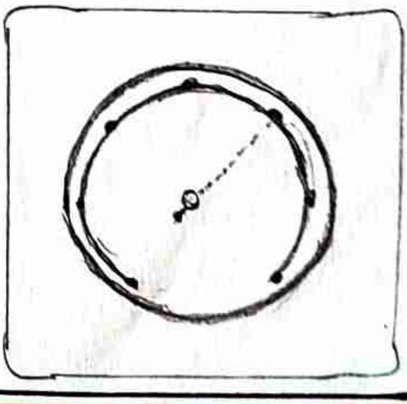
use chemicals which are made from renewable (i.e. plant-based) sources, rather than other, equivalent chemicals originating from petrochemical sources.

8. Reduce derivatives



minimize the use of temporary derivatives such as protecting groups. Avoid derivatives to reduce reaction steps, resources required, and waste created.

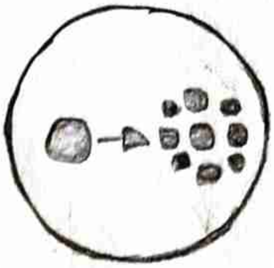
9. Catalysis



Use catalytic instead of stoichiometric reagents in reactions. choose catalysts to help increase selectivity. minimize waste, and reduce reaction times and energy demands.

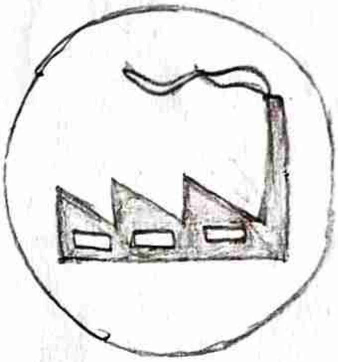
10. design For degradation.

Design chemicals that degrade and can be discarded easily. Ensure that both chemicals and their degradation products are not toxic, bioaccumulative, or environmentally persistent.



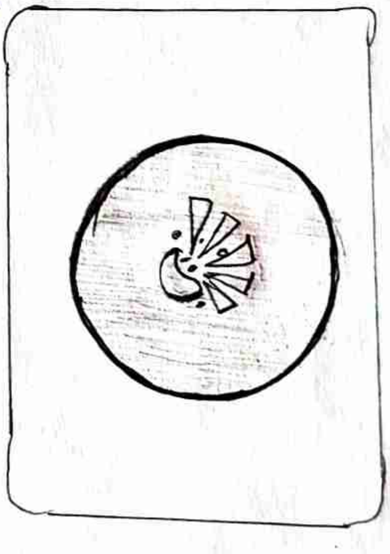
11. Real-Time Pollution Prevention

Monitor chemical reactions in real-time as they occur to prevent the formation and release of any potentially hazardous and polluting substances.



12. Safer chemistry For Accident Prevention

choose and develop chemical procedures that are safer and inherently minimize the risk of accidents. know the possible risks and assess them beforehand.



GOVERNMENT DEGREE COLLEGE FOR WOMEN

KARIMNAGAR

DEPARTMENT OF CHEMISTRY

STUDENT STUDY PROJECT

TOPIC: ELEMENTS OF PERIODIC TABLE

NAME OF THE SUPERVISOR: DR.M.PRASHANTHI

NAME OF THE STUDENT : 1.SADIYA KONAIN
2.LUBNA NAZNEEN

GROUP : BSC.BZC-II YEAR/IV SEM/EM

Periodic Table of the Elements

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 **H** Hydrogen 1.008																	2 **He** Helium 4.003
3 **Li** Lithium 6.941	4 **Be** Beryllium 9.012											5 **B** Boron 10.811	6 **C** Carbon 12.011	7 **N** Nitrogen 14.007	8 **O** Oxygen 15.999	9 **F** Fluorine 18.998	10 **Ne** Neon 20.180
11 **Na** Sodium 22.990	12 **Mg** Magnesium 24.305											13 **Al** Aluminum 26.982	14 **Si** Silicon 28.086	15 **P** Phosphorus 30.974	16 **S** Sulfur 32.066	17 **Cl** Chlorine 35.453	18 **Ar** Argon 39.948
19 **K** Potassium 39.098	20 **Ca** Calcium 40.078	21 **Sc** Scandium 44.956	22 **Ti** Titanium 47.88	23 **V** Vanadium 50.942	24 **Cr** Chromium 51.996	25 **Mn** Manganese 54.938	26 **Fe** Iron 55.933	27 **Co** Cobalt 58.933	28 **Ni** Nickel 58.693	29 **Cu** Copper 63.546	30 **Zn** Zinc 65.39	31 **Ga** Gallium 69.732	32 **Ge** Germanium 72.61	33 **As** Arsenic 74.922	34 **Se** Selenium 78.09	35 **Br** Bromine 79.904	36 **Kr** Krypton 84.80
37 **Rb** Rubidium 84.468	38 **Sr** Strontium 87.62	39 **Y** Yttrium 88.906	40 **Zr** Zirconium 91.224	41 **Nb** Niobium 92.906	42 **Mo** Molibdenum 95.94	43 **Tc** Technetium 98.907	44 **Ru** Ruthenium 101.07	45 **Rh** Rhodium 102.906	46 **Pd** Palladium 106.42	47 **Ag** Silver 107.868	48 **Cd** Cadmium 112.411	49 **In** Indium 114.818	50 **Sn** Tin 118.71	51 **Sb** Antimony 121.760	52 **Te** Tellurium 127.6	53 **I** Iodine 126.904	54 **Xe** Xenon 131.29
55 **Cs** Cesium 132.905	56 **Ba** Barium 137.327	57-71 Lanthanides	72 **Hf** Hafnium 178.49	73 **Ta** Tantalum 180.948	74 **W** Tungsten 183.85	75 **Re** Rhenium 186.207	76 **Os** Osmium 190.23	77 **Ir** Iridium 192.22	78 **Pt** Platinum 195.08	79 **Au** Gold 196.967	80 **Hg** Mercury 200.59	81 **Tl** Thallium 204.383	82 **Pb** Lead 207.2	83 **Bi** Bismuth 208.980	84 **Po** Polonium [208.982]	85 **At** Astatine 209.987	86 **Rn** Radon 222.018
87 **Fr** Francium 223.020	88 **Ra** Radium 226.025	89-103 Actinides	104 **Rf** Rutherfordium [261]	105 **Db** Dubnium [262]	106 **Sg** Seaborgium [266]	107 **Bh** Bohrium [264]	108 **Hs** Hassium [269]	109 **Mt** Meitnerium [268]	110 **Ds** Darmstadtium [269]	111 **Rg** Roentgenium [272]	112 **Cn** Copernicium [277]	113 **Uut** Ununtrium unknown	114 **Fl** Flerovium [289]	115 **Uup** Ununpentium unknown	116 **Lv** Livermorium [298]	117 **Uus** Ununseptium unknown	118 **Uuo** Ununoctium unknown

57 **La** Lanthanum 138.906	58 **Ce** Cerium 140.115	59 **Pr** Praseodymium 140.908	60 **Nd** Neodymium 144.24	61 **Pm** Promethium 144.913	62 **Sm** Samarium 150.36	63 **Eu** Europium 151.966	64 **Gd** Gadolinium 157.25	65 **Tb** Terbium 158.925	66 **Dy** Dysprosium 162.50	67 **Ho** Holmium 164.930	68 **Er** Erbium 167.26	69 **Tm** Thulium 168.934	70 **Yb** Ytterbium 173.04	71 **Lu** Lutetium 174.967
89 **Ac** Actinium 227.028	90 **Th** Thorium 232.038	91 **Pa** Protactinium 231.036	92 **U** Uranium 238.029	93 **Np** Neptunium 237.048	94 **Pu** Plutonium 244.064	95 **Am** Americium 243.061	96 **Cm** Curium 247.070	97 **Bk** Berkelium 247.070	98 **Cf** Californium 251.080	99 **Es** Einsteinium [254]	100 **Fm** Fermium 257.095	101 **Md** Mendelevium 258.1	102 **No** Nobelium 259.101	103 **Lr** Lawrencium [262]

1-Hydrogen

Symbol : H

Atomic mass : 1.007840

Atomic number: 1

Electron configusation: 1s1

Hydrogen (H), is a colouless, odouless, tasteless, flament gaseous substance that is the simplect member of the family of chemical elements.

2. Helium

Symbol: He

Atomic mass: 4.002602u

Atomic number: 2

Electron configuation: 1s2

Helium is a chemical element with the symbol He and atomic number 2, it is a colouless, odusless, tasteless, non toxic, intes, monatomic gas and the noble gas group in the periodic table.

Its boiling and melting point are the lowest among all the elements.

3. Lithium

Symbol: Li

Atomic mass: 6.941 U

Atomic number: 3

Electron configuration: $1s^2\ 2s^1$

Lithium is a chemical element with the symbol Li and atomic number 3. it is a soft, silvery white alkali metal. under standard conditions, it is the least dense metal and the least dense solid element.

4. Beryllium

Symbol: Be

Atomic mass 4

Atomic number: 9.012182U

Electron configuration: [He] $2s^2$

Beryllium is a chemical element with the symbol Be and atomic number 4. it is a steel-gray strong, light weight and brittle alkaline earth metal.

5- Boron

Symbol: B

Atomic mass: 10.811U

Atomic number: 5

Electron configuration: [He] 2s2 2p1

Bron is an element, Bron has been consumed for menstured cramps and boric acid has been used vaginally for yeast infections, but evidence is limited.

6- carbon
Symbol: C
Atomic mass: 12.011U
Atomic number: 6
Electron configuration: [He] 2s2 2p2

Carbon(c), nonmetallic chemical element in Group 14 (IVA) of the peiidic table. Although wielely distributed in nature, carbon is not particularly plentiful.

7- Nitrogen
Symbol: N
Atomic mass: 14.0067U
Atomic number: 7
Electron configuration: [He] 2s2 2p3

Nitrogen (N), nonmetalic element of Group 15[Va] of the periodic table. It is a colouless, odouless, tasteless gas that is the most ptentiful element in Earth's atmosphere and is a constituent of all living matter.

8- oxygen
Symbol: O
Atomic mass: 15.999U
Atomic number: 8
Electron configuration: [He] $2s^2 2p^4$

oxygen is the chemical element with the symbol O and atomic number 8. It is a member of the chalcogen group in the periodic table, a highly reactive nonmetal, and an oxidizing agent that readily forms oxides with most elements.

9- Fluorine

Symbol: F

Atomic mass: 18.998403 U

Atomic number: 9

Electron configuration: [He] 2s2 2p5

Fluorine (F), most reactive chemical element and the hightest member of the halogen elements, or group 17 of the periodic table.

10-Neon

Symbol: Ne

Atomic mass: 20.1797 U

Atomic number: 10

Electron configuration: [He] $2s^2 2p^6$

Neon is a chemical element with the symbol Ne and atomic number 10. It is a noble gas. Neon is a colorless, odorless, inter monatomic gas and the density of air.

11. Sodium

Symbol: Na

Atomic mass: 22.989769 U

Atomic number: 11

Electron configuration: [Ne] $3s^1$

Sodium is a chemical element with the symbol Na and atomic number 11. It is a soft, silvery-white, highly reactive metal. Sodium is an alkali metal, being in group 1 of the periodic table.

* Promethium Pm

Electron Configuration: ~~61~~ [xe] $4f^5 6s^2$

61
Pm
Promethium 145

atomic Number: 61

atomic Mass: 145

Discovered by: Jacob A Marinsky lawerence E. Glendenin and Charles D. Coryell. (1945).

* Uses:- Most Promethium is Used Only in research.

- A little Promethium is Used in Specilaized atomic batteries these are roughly the size of a drawing pin and are used for pacemarkers, guided missiles and radio.

* Samarium Sm

62
Sm
150.36

Electron Configuration: [Xc] $4f^6 6s^2$

atomic Number: 62

atomic Mass: 150.364

Discovered by: Paul-Emile lecoq de Boisbaudran.

Samarium is a chemical element with the Symbol Sm and atomic Number 62. it is a moderately hard silvery metal that slowly oxidizes in air Being.

a typical member of the lanthanide Series, Samarium assumes the oxidation state.

* Europium Eu.

63
Eu
151.964

- Electron Configuration: [Xe] $4f^7 6s^2$
- Atomic Number: 63
- Atomic Mass: 151.964.u
- Discovered by: in 1901 Eugene-Anatole Demarcay.

* Everyday Uses:-

The Primary Use of europium is in red phosphors in optical displays and TV. Screens that Use cathode-ray tubes and in glass for Fluorscent lamps.

* Gadolinium Gd.

64
Gd
157.25

- Electron Configuration: [Xe] $4f^7 5d^1 6s^2$
- Atomic Number: 64
- Atomic Mass: 157.25u
- Discovered by: Jean Charles Galissard de marignac (1880)

* Importance:-

The major Uses of gadolinium Compounds include hosts for phosphors for Fluorscent lamps, x-ray

* Thallium Tl

81
Tl
204.383

Electron Configuration: [Xe] $4f^{14}5d^{10}6s^{2}6p^{1}$

atomic number: 81

atomic Mass: 204.38334

* Usages:- Thallium is a heavy metal Used in the manufacture of electronic Components, Optical lenses, Semiconductor materials, alloys, gamma radiation detection equipment, Imitation jwellery, artist's paints low temparature thermometers and green fireworks.

* Lead Pb

82
Pb
327.5

Electron Configuration: [Xe] $6s^{2}4f^{14}5d^{10}6p^{2}$

atomic Number: 82

atomic Mass:- 327.5°C

Discovered by:- Middle East (7000 BCE).

Usage:- Lead (Pb) is a chemical element with the Symbol Pb and atomic number 82. It is a heavy metal that is denser than most Common materials.

* Bismuth Bi

83
Bi
208.98

Electron Configuration: [Xe] $4f^{14}5d^{10}6s^{2}6p^{3}$

atomic Number: 83

atomic mass: 208.98044

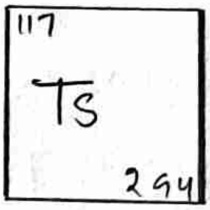
Discovered by: Claude François Geoffroy

atomic Mass: 2934

Discoverer: Joint institute for Nuclear Research.

Since only a few atoms of livermorium have ever been made and ~~eath~~ each one decays within milliseconds, not much is known about this element.

* Tennessine Ts



Electron Configuration: $5f^{14} 6d^{10} 7s^2 7p^5$

atom Number: 117

atomic Mass: ~~6to~~ 294

- Discoverers: Yuri Oganessian, Joint institute for Nuclear Research.

- Tennessine is a synthetic chemical element with the symbol Ts and atomic Number 117. It is the heaviest known element and the penultimate.

* Oganesson Og

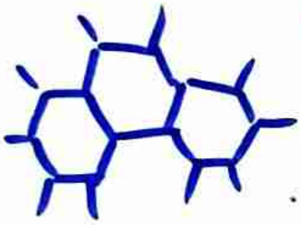
- A transuranium element that occupies position 118 in the periodic table and is one of the noble gases.

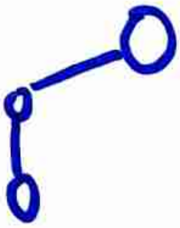
CHeMISTRY

2 Helium

3 sulfur

Project work





Jyothi Medam

Zuha

Ayesha Athar

Topic := Magnetic properties of co-ordination compounds.

Name :- K. Sushma

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B.Sc IV Sem (MB2C)

K. Kalpana, K.K. Nikitha

Da

Magnetic properties of co-ordination compounds

Introduction:-

Motion of electric charge creats a magnetic field. electron being a negatively charged particle may be considered as a small magnet. This electron has orbital motion and also spin. Thus the magnetic momentum of an electron is due to its and orbital motion.

When a substance is sept in the magnetic field. the induced magnetic field may act opposite to the external magnetic field or it may add to the external field.

Thus compounds or atoms may show different types of magnetic behaviour. These are

- * paramagnetism
- * Diamagnetism,
- * ferro-magnetism
- * antiferromagnetism
- *ferrimagnetism

Some such types of magnetic behaviours:-

The quantum number ms represents the spin of a single electron as +(1/2) or -1/2) When as electron is linked with another, its spin of is negated, but when the electron is unparied. it form a weak

magnetic field. The paramagnetic effects are amplified when there are more unparied electrons. The repulsive forces between electrons in cause the electron in the compound cause the electron configuration of a transition metal (d-block) to charge in a coordination compound. The chemical may be paramagnetic or diamagnetic, depending on the strength of the ligand.

The magnetic moment of a system containing unpaired electrons is proportional to the number of unpaired electrons:-

↓ The stronger the magnetic moment, the more unpaired electrons there are.

The force that a substance feels in a magnetic field is measured by magnetic susceptibility.

properties of magnet:-

* The magnet attracts ferromagnetic materials (iron)

* Magnetic poles exist in magnets, and each magnet has two magnetic poles, N pole and S pole

* On suspending a magnet freely, it always comes in the north-south direction.

* When two magnets are in close proximity, the same magnetic poles repel and push away from one other, where as different magnetic poles attract and stick to each other.

* As a result, the same poles repel each other while the opposite poles attract.

properties of magnetic Lines of force:-

* Each line is a continuous and closed curve.
* The magnetic lines of force start from the north pole of the magnet and end at the south Pole.

* These lines will never come into contact with one another.

* They are densely packed near the poles, where the magnetic field is particularly intense.

* They have an effect on the needle of the magnetic compass

Ferromagnetism or permanent magnets!-

The fundamental mechanism by which certain materials (such as iron) produce permanent magnets is ferromagnetism. This indicates the material has persistent magnetic properties rather than merely expressing them when exposed to a magnetic properties rather than merely exposed to a magnetic field from the outside. The electrons of atoms is a ferromagnetic element are same charge. These domains align in the presence of a magnetic field, resulting in parallel charges over the entire complex. The number of unpaired electrons and the atomic size of a chemical determine whether it is ferromagnetic or not.

Paramagnetism. Attracted to the magnetic field:-

The magnetic condition of an atom having one or more unpaired electrons is known as Paramagnetism. Due to the electrons magnetic dipole moments, the magnetic field attracts the unparied electrons. Before any orbital is to be twice occupied, according to Hund's Rule, electrons must occupy it singly. this results in a higher unpaired electrons in the atom. unpaired electrons have magnetic properties in both directions in because they can spin in either way. magnetic fields attract paramagnetic atoms because of this ability. O_2 or diatomic oxygen, is an excellent example of paramagnetism (described using the molecular orbital theory).

Magnetic moments of molecules and ions :-

Experimental evidence of magnetic measurement supports the theory of high- and low-spin complexes. Remember that molecules such as O_2 that contain unpaired electrons are attracted to magnetic field. Many transition metal complexes have unpaired electrons and paramagnetic. paramagnetic substances are attracted to magnetic fields. Many transition metal complexes have unpaired electrons and hence as paramagnetic. molecules such as N_2 and ions such as Na^+ and $[Fe(CN)_6]^{4-}$ that contain no unpaired electrons are diamagnetic. Diamagnetic substances have a slight tendency to be repelled by magnetic fields.

When an electron in an atom or ion is unpaired, the magnetic moment due to its spin makes the entire atom or ion paramagnetic. The size of the magnetic moment of a system containing unpaired electrons is related directly to the number of such electrons. The greater the number of unpaired the larger the magnetic moment is used to determine the number of unpaired electrons present. The measured magnetic moment of low-spin d^6 $[Fe(CN)_6]^{4-}$ confirms that iron is diamagnetic, whereas high-spin d^6 $[Fe(H_2O)_6]^{2+}$ has four unpaired electrons with a magnetic moment that confirms this arrangement.

Hunds' Rule:- states that electrons fill all available orbitals with single electrons before pairing up, while maintaining parallel spins (paired electrons have opposing spins]. For a set of five degenerate d-orbitals in an uncompleted metal atom, electrons fill all orbitals before pairing up, when increases into the higher-energy orbital or paired with an electron in a lower-energy orbital. The strength of the ligands determine which option is chosen. If the splitting energy is greater than the pairing energy. The electrons will pair up; if the pairing energy is greater, unpaired electrons will occupy higher energy orbitals. In other words, with a strong-field ligand, low-spin complexes are usually formed; with a weak field ligand, a high-spin complex is formed.

Low-spin complexes contain more paired electrons because the splitting energy is larger than the pairing energy. These complexes, such as $[Fe(CN)_6]^{3-}$, are more often diamagnetic or weakly paramagnetic. Likewise, high-spin complexes usually contain more unpaired electrons because the pairing energy is larger than the splitting energy. with more unpaired electrons, high-spin complexes are often paramagnetic. The unpaired electrons in paramagnetic compounds create tiny magnetic field, similar to the domains in ferromagnetic materials. The strength of the paramagnetism of a coordination complex increases with the numbers of upaired electrons; a higher-spin complex is more paramagnetic. The occurrence and relative strength of paramagnetism can be predicted by determining whether the compound is coordinated to a weak field ligand or a strong field ligand.

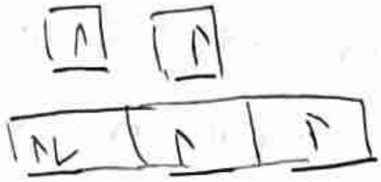
Example-1

Which ligand generates a stronger magnetic complex ion when bound to fe^{+2}. EDTA or CN^{1-}?

Solution:-

1. $[fe(edta)3]^{1-2}$

fe has 6 valence e^- edta is a weaker ligand than cN that means splitting ∈ is smaller there are 6 binding sites: octahedral



2. $fe(CN)6]^{1-3}$

fe has 5 valence e^- CN- is a stronger ligand these are, That means splitting ∈ is larger there are 6 binding sites: octahe there

Since $[fe(EDTA)_3^{-2})$ has more unpaired electrons than $[FeCN_6^{-3}]$ it is more paramagnetic

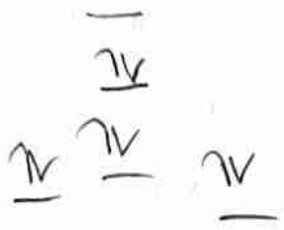
Example - 2

ZnI_4 have eight valence electrons. If it is found to be diamagnetic, then does it occupy a ~~tetra~~ tetrahedral or square plan geometry?

solution:-

The splitting pattern for the two geometries differs and hence the electron configuration from adding the eight electrons also differs.

1) Tetrahedral model 2) square planar model



The tetrahedral geometry has two unpaired electrons and the square planer geometry has zero. Since ZnI_4 is diamagnetic, it must have a square planar geometry.

Exercise

For each of the following coordination complexes, identify if it is paramagnetic or diamagnetic?

* octahedral, low spin, d^4,
* octahedral, low spin, d^6,
* tetrahedral, low spin, d^4
* square planar, low spin, d^8

Diamagnetism Repelled by the magnetic field:-

The magnet has no effect on molecular nitrogen (N_2) since it has no unpaired electrons and is diamagnetic. The presence of paired electrons, i.e., no unpaired electrons distinguishes diamagnetic compounds. The electron spins are oriented in different directions according to the Pauli exclusion principle, which stipulates that no two electrons may occupy the same quantum state at the same moment. As a result, the magnetic fields of the electrons cancel out, leaving no net magnetic moment and preventing the atom from being attracted to a magnetic field.

Origin of magnetism:-

Electron is a small sphere of negative charge which spins over its own axis. This spinning of the electron produces magnetic field. "spin magnetic moments". This is given by

$\mu_s = \sqrt{n(n+2)}$ where n = no. of unpaired electrons

orbital motion of electrons also contribute, towards the values of magnetic moment.

We have $\mu_{S+L} = \sqrt{4S(S+1)+L(L+1)}$

L = orbital angular momentum quantum No. for ions. In transition metals, value for orbital motion is negligible.

Units:- Magnetic moments are expressed in Bohr magnetons.

$$1BM = \frac{eh}{4\pi mc}$$

e = charge on electron

m = its mass

c = velocity of light

Example:- for an atom or ion with one paired electron, electron $s=\frac{1}{2}$

$\therefore S = 1 \times \frac{1}{2} = \frac{1}{2}$

Then $\mu_S = \sqrt{4S(S+1)} = \sqrt{4 \times \frac{1}{2}\left[\frac{1}{2} + 1\right]} = \sqrt{3} = 1.73\,BM$

for two unpaired electron $\mu_S = \sqrt{4 \times 1(1+1)}$

$= \sqrt{8} = 2.83\,BM$

calculation of magnetic moment (μ) for following complexes:-

1) $[Fe(CN)_6]^{-4}$:-

$_{26}Fe$ configuration:- $[Ar]\,3d^6\,4s^2$

Fe^{+2} configuration:- $[Ar]\,3d^6\,4s^0$

(↑↓) (↑) (↑) (↑) (↑)

No of unpaired electrons (n) = 4

paramagnetic moment (μ) $= \sqrt{n(n+2)}\,BM$

$\mu = \sqrt{4+(4+2)}$

$= \sqrt{4(6)}$

$= \sqrt{24}$

$= 2.9\,BM$

2) $[Fe(CN)_6]^{-3}$:-

Fe_{26} configuration :- $[Ar]\,3d^6\,4s^2$

Fe^{+3} configuration :- $[Ar]\,3d^5\,4s^0$

(↑) (↑) (↑) (↑) (↑)

No of unpaired electrons (n) = 5

$\mu = \sqrt{n(n+2)}$ BM

$\mu = \sqrt{5(5+2)}$; $\mu = \sqrt{35}$; $\mu = 5.9$ BM

3) $[VCl_4]^-$:-

V_{23} configuration : $[Ar]\,3d^3\,4s^2$

V^{+3} configuration : $[Ar]\,3d^2\,4s^0$

(↑) (↑) ( ) ( ) ( )

No. of unpaired electrons (n) = 2

$\mu = \sqrt{n(n+2)}$ BM

$\mu = \sqrt{2(2+3)}$

$= \sqrt{2(5)}$

$= \sqrt{10}$

$\mu = 2.9$ BM

4) $[Co(NH_3)_6]^{+3}$:-

Co_{27} configuration $[Ar]3d^7 4s^2$

Co^{+3} configuration $[Ar]\ 3d^6 4s^0$

(↑↓) (↑) (↑) (↑)(↑)

No of unpaired electrons(n)=4

$$\mu = \sqrt{n(n+2)}\ BM$$

$$= \sqrt{4(4+2)}$$

$$= \sqrt{4(6)}$$

$$= \sqrt{24} = 4.9\ B.M$$

5) $[Ni(CN)_4]^{-2}$:-

Ni_{28} configuration $[Ar]3d^8 4s^2$

Ni^{+2} configuration $[Ar]\ 3d^8\ 4s^0$

(↑↓) (↑↓) (↑↓) (↑)(↑)

No. of unpaired electrons(n)=2

$$\mu = \sqrt{n(n+2)}\ B.M$$

$$= \sqrt{2(2+2)}$$

$$= \sqrt{2(4)}$$

$$= \sqrt{8}$$

$$= 2.8\ BM$$

6) $[Mn(H_2O)_6]^{+2}$:-

Mn_{25} configuration $[Ar]\,3d^5\,4s^2$

Mn^{+2} configuration $[Ar]\,3d^5\,4s^0$

(↑)(↑)(↑)(↑)(↑)

No of unpaired electrons(n)=5

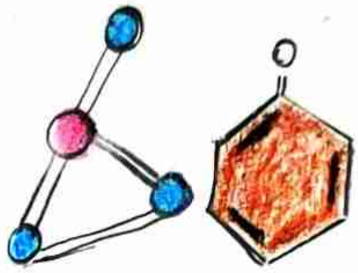
$$\mu = \sqrt{n(n+2)}\ B.M$$
$$= \sqrt{5(5+2)}$$
$$= \sqrt{5(7)}$$
$$= \sqrt{35}$$
$$= 5.9\ B.M$$

conclusion:-

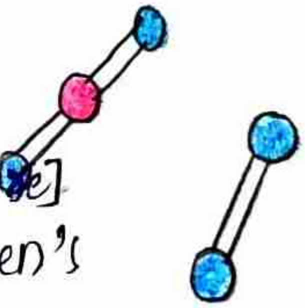
The coordination metal complexes exhibit magnetic nature due to the presence of electrons in the d orbital, either paired or unpaired. Magnetism is mainly of three types:- paramagnetism, diamagnetism and ferromagnetism. paramagnetism is caused due to the presence of unpaired electrons in the d orbital and diamagnetism results due to the fully paired electron in d orbitals. ferromagnetism is exhibited by metal complexes that can retain their magnetism for a longer time once magnetised. There are some properties that a magnet exhibits, like the same poles will repel and the unlike poles will show an attraction, and when the magnet is suspended, it will always align in the N-S direction.

..Study......
..Project....

Submit by :- Nisha Afreen
Sara Shahewar- Bt.B.C [210771645721007]
Shaziya Khanam- BZC [210771644451103]
H.T no :- 210771644451078
D. Geethanjali

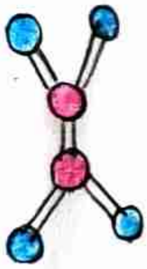


Class :- BZC II^nd sem



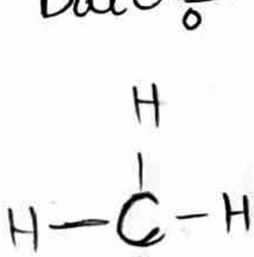
Topic :- [Colligative properties, osmotic Pressure]

College :- Govt. Degree college fo women's

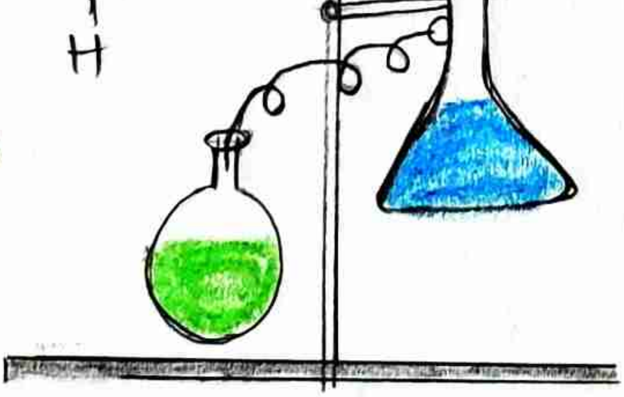


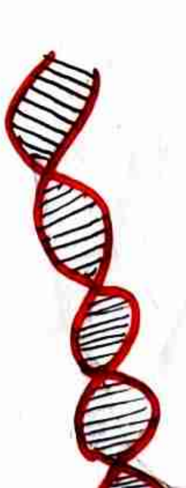
Date :- 6-7-2022

Submit to :-
G. Jyothi



$$H-\overset{\displaystyle H \atop |}{\underset{\displaystyle | \atop H}{C}}-H$$





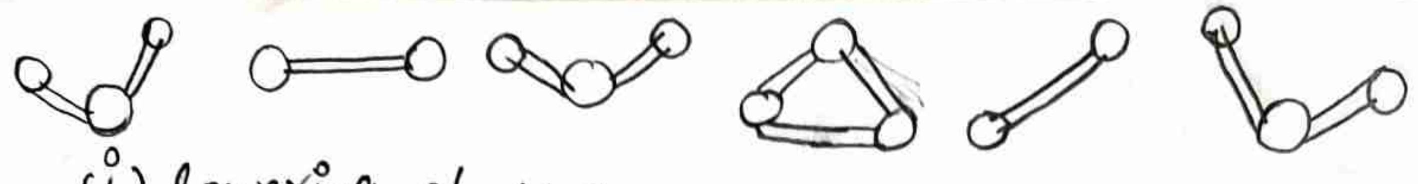
Dilute Solution & Colligative properties

Introduction :- The properties which depends on number of solute particles present in the solution are called colligative properties. This properties do not depend on the nature of solute but only depends on the concentration of solute.

Explenation :- Colligative properties are exhibited only by the dilute solutions in which non-volatile solute is dissolved There are 4 colligative properties

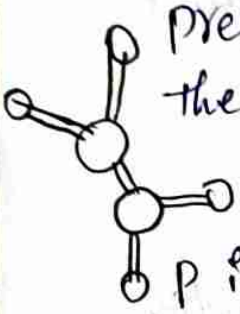
Solution :- The hamogeneous mixture of two (or) more subtances is called solution.

(i) The lowering of vapour pressure of solvet [ΔP]
(ii) osmotic pressure of solution [π]
(iii) Elevation boiling Point of solvet [ΔT_b]
(iv) Depression in freezing Point of solvet [ΔT_f]

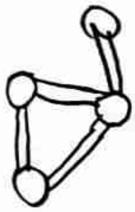


(i) lowering of vapour pressure :-

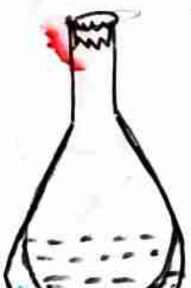
When a non- volatile solute is added to a volatile solvent to make a solution, then vapour pressure of the solvent decreases - that means the vapous pressure of the solution is less - than the v.p of the pure solvent (po).



$\Rightarrow p^0$ is the vapour pressure of the pure solvent, P is the vp of solution, then po > p. so the different (po - p) is called lowering of v.p of the solvent a solution. at a given tempera (po-p) is lowering of vapour pressure of the ratio $\left(\frac{Po-P}{p^o}\right)$ of lowering of vapous pressure to the solvent p^o is known as (RLVP). (Relative lowerin of vapour pressure)



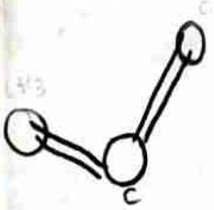
According to Roult's law RLVP is directly proportional to the mole fraction of the non-volatile shote (xB)



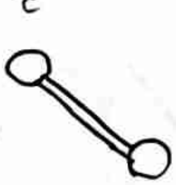
$$\frac{Po-P}{p^o} = (x_B \text{ (molo. fraction of solute B)})$$

$$\frac{Po-P}{p^o} = \frac{n_B}{n_A+n_B}$$

(n_B = no - of moles of B
n_A = no. of moles of A



$$\frac{Po-P}{p^o} = \frac{\text{wt of Solute}(W_B)}{\text{mol wto of Soluto }(M_B)}$$



$$\frac{P_0 - P}{P_0} = \frac{\dfrac{\text{wt of solute (WB)}}{\text{mol. wt of solute (MB)}}}{\dfrac{\text{wt of solvent (WA)}}{\text{m.wt solvent MA}} + \dfrac{\text{wt of solute (WB)}}{\text{m-wt of solute (MB)}}}$$

since colligative Properties are only conured with dilute Solutions, n_B in the demominated canbe negleted

$$\frac{P_0 - P}{P^0} = \frac{n_B}{n_A} \quad (\because n_B <<<< n_A)$$

$$\boxed{\frac{P_0 - P}{P^0} = \frac{W_B}{M_B} \times \frac{M_A}{W_A}}$$

Raoults law :-

Raoults law derive a relation between relative lowering of vapour pressure and concention of the Solute.

$$\frac{P^0 - P}{P^0} = X_B$$

$$\frac{P^0 - P}{P^0} = \frac{n_B}{n_A + n_B}$$

n_B = number of moles of Solute.

n_A = number of mole of solvent.

This equation is called Complete Raoutslaw equation.

#Osmosis :- osmosis is the spontaneous us passage of solvent from solution of lower concentration into a solution of higher concentration

Reverse osmosis :- The phenomenon of flowing solvent from a solution of higher concentration in to a solution of lower when the two solutions are separated by semi permeable is reverse.

Osmotic pressure(π) :-

The excess pressure is applied to the solution to order to prevent the flow of solvent in to the solution through the semi permnable membrane is called "osmotic pressure". osmotic pressure dented by "π"

⟹ vonthoff's absewed that solutions behaves like ideal gas so-they bey Boyle's law charles lau Avagadrop law.

Semi permeable membrane :-

The excess pressure is applied to the solution in oder to permeable only but not solute in to the through is called "semi permeable membrane".

Ex:- cell wall, lining of eggs, parchment paper ect.

laws of osmotic pressure :-

(i) Vant - Hoff's Boyle's law :-

At constant temperature the osmotic pressure of a solution is directly proportional to the concentration of the solue.

mathematically,

$$\pi \alpha C$$

$$\text{But} \quad C = \frac{n}{V} \quad C \alpha \frac{1}{V}$$

$$\therefore \pi \alpha \frac{1}{V}$$

At constant temperature the osmatic pressure of a dilute solution is inversely proportional to this volume.

$$\pi \alpha \frac{1}{V}$$

$$\pi V = \text{constant}$$

$$\pi_1 V_1 = \pi_2 V_2$$

(2) Vant - Hoff's charles law :-

The osmatic pressure of a dilute solution is directly proportional to its absolute temperatur at constant volume

$$\pi \alpha T \text{ (at constant T,V)}$$

(or) $$\frac{\pi}{T} = \text{constant}$$

Detemination of molecular weight from osmtic pressure equation :-

Knowing the osmatic pressure of a solution, the molecalr weight of the the calcuted.

$$\pi = CST$$

or $$\pi = \frac{n}{V} ST$$

$$\pi V = nST$$

$$\pi V = \frac{w}{m} ST \quad (\because n = \text{number of moles} = \frac{w}{m})$$

$$M = \frac{WST}{\pi V}$$

where

M = molecular weight of the Solute
W = weight of solute
π = Osmotic Pressure
T = Temperature
S = Solution contant
V = Volume of dilute solution.

Elevation of boiling Point (ΔT_b) :-

The tempera at which the vapour pressure of liquid becomes equal to the atmospheric Pressure is called boling Point.

⇒ The diffence pressure of a solution is alway lower than pure solvent.

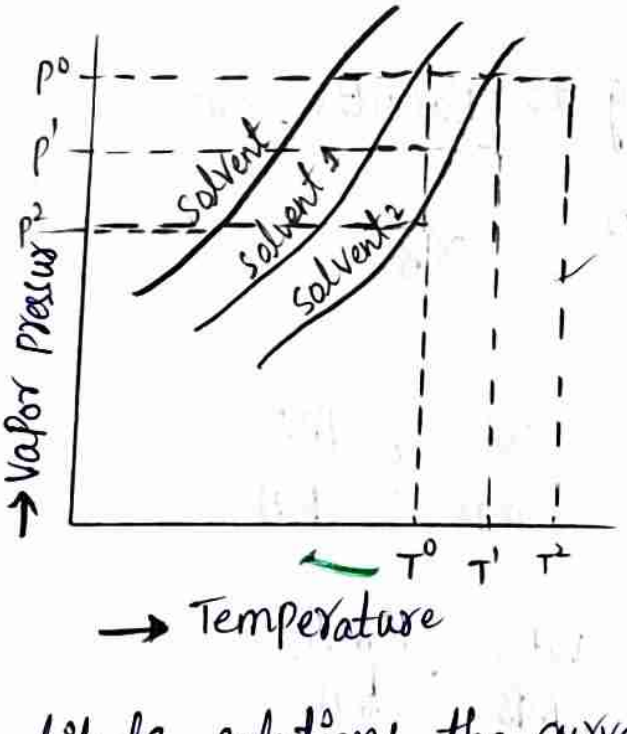
boiliong Point of a pure solvent (T^0) is called the elevation of boiliong point.

$$\Delta T_b = T = T^0$$

Realation between lowering of Vapour pressure (ΔP) and elevation of boiling point ΔT_b

The elevation in boiling Point of solvent is due to dissolving of non-volatile solute and it is determined by the vapour pressure curves.

P^0, P^1, P^2 are vapour pressures of pure solvent, dilute solution, concentrated solution at their boiling points. T^0, T^1, T^2.



In case of dilute solutions the curves, are Paralle to each other. Herce the triangles ΔABD, ΔACE are similar triangles.

$$\frac{AD}{AE} = \frac{AB}{AC}$$

$$\frac{p^0 - p^1}{p^0 - p^2} = \frac{T^1 - T^0}{T^2 - T^0}$$

$$\frac{\Delta p^1}{\Delta p^2} = \frac{\Delta T^1}{\Delta T^2}$$

$$\Delta p \propto \Delta T_b \text{ ——— } ①$$

from this, we say that elevation of boiling point is directly proprotinal lowering of vapour pressure.

***Determination of molecular weight from elevation of B.P :-**

According to Raoults law.

$$\frac{p^0 - p}{p^0} = X_B$$

$$\frac{p^0 - p}{p^0} = \frac{W_B}{M_B} \times \frac{M_A}{W_A}$$

$$p^0 - p = \frac{W_B}{M_B} \frac{p^0 M_A}{W_A}$$

At constant 'T' $p^0 M_A$ is constant.

$$\Delta p \propto \frac{WB}{MB} \times \frac{1}{WA} \text{ ——— } ②$$

from equation (1) and (2)

$$\Delta T_b \propto \frac{WB}{MB} \times \frac{1}{WA}$$

$$\Delta T_b = k_b . \frac{WB}{MB} \times \frac{1}{W_A} \text{ ——— } ③$$

If weight of solvent is in grams the above equation become

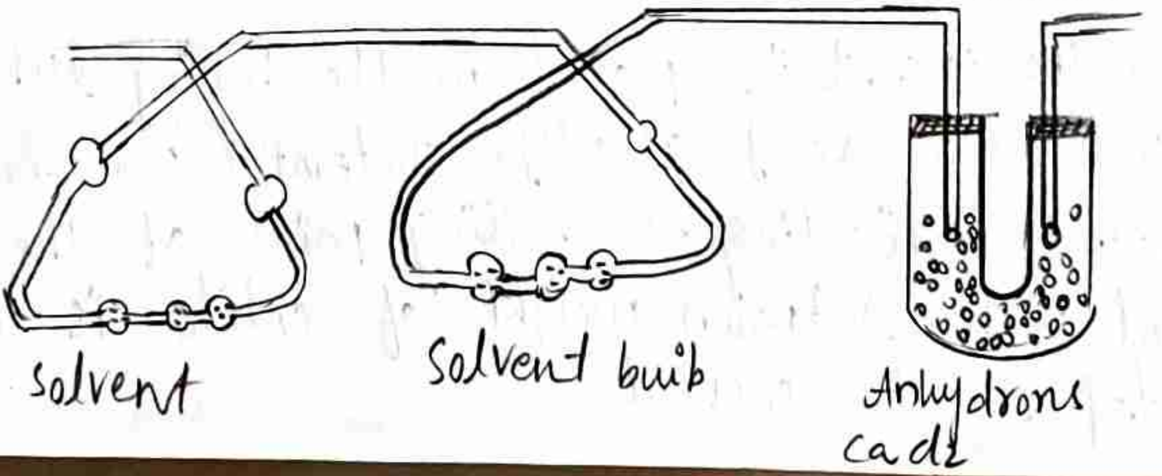
Where $\Delta T_b = k_b . \frac{WB}{M_B} \times \frac{1000}{WA}$

kb = boiling points contant (or) molal elevation constant (or) Ebbulioscopic contant.

If $\frac{W_B}{M_B} = 1$ and $W_A = 1kg$

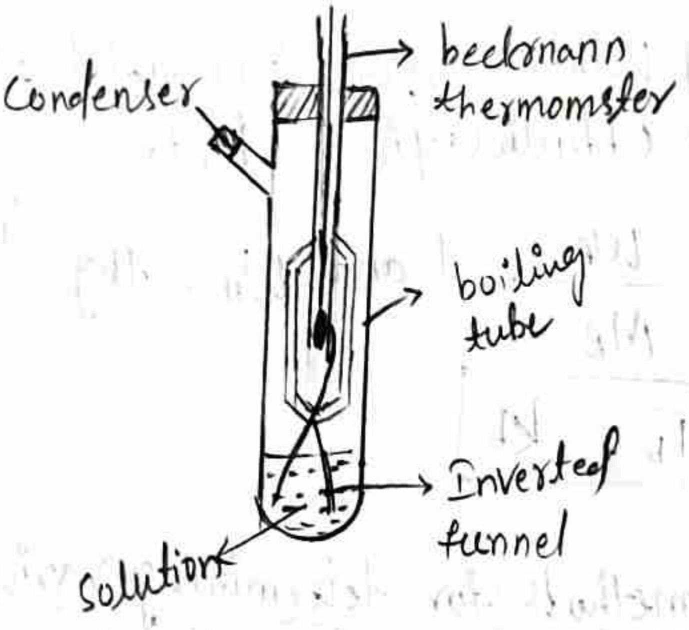
$$\boxed{\Delta T_b = kb}$$

→ Experimental methods for determining various colligative properties Determination of lowering of vapour pressure by oswald's walker method (or) gas saturation :-



The operators consists of two sets of bulbs on set of bulbs is filed with solution, and second set of bulbs with pure solvent, weights determined. These are connected to each Dry air passed successively through the solution, solvent and cacl$_2$ thei's The dry air passes taken the vapor pressure of the solution is proportinal to the $(p^\circ - p)$.

* Experiment determination of Elevation of boiling Point by cottel's method :-



The cottel's boiling point apparatus as show in the figure.

⟹ The solvent is placed in the boiling tube. It is become very slowly. Thetempet soon becorres Constatnt indicating the boiling point of the solvent (T°). A known weight of solute is then added to the solvent.

Elevation in boiling point $\Delta T_1 = T - T^0$

T^0 = Boiling point of the solvent.

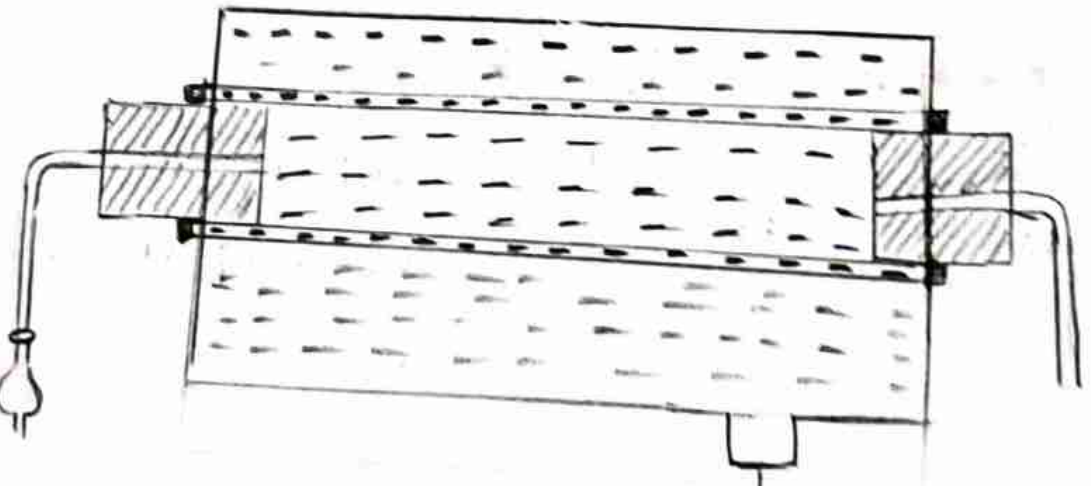
T = Boiling point of the solution

Experimental determination of freezing point depression by Rast's camphor method :-

This method was derived by Rast determing molecular weights of solutes which are soluble.

$$\Delta T_1 = T^0 - T$$

→ A small amount of powder of camphor was introduced in a capillary tube and its melting point (T^0) is determined. A known amount of solute is mixer is determined. The difference between two points gives depression of freezing point.



The method is the best thethod for measurement of osmotic pressure The operator consists of porous pot open at the both ends. The porous pot with a deposit of copper ferro cyanide membrane in its walls is enclosed in a metallic jacket. One end of this pot is conneted.

Advantages :-

(1) It is quick and accurate
(2) It can be Used for determing high osmotic pressure.
(3) The concentration of solution does not change during the experiment.

Conclusion :-

from this project we conclude that we learned about the colligative perperties, law's and osmotic pressure he found out.

◆

Govt. Degree College for Women, Knr

CHEMISTRY PROJECT

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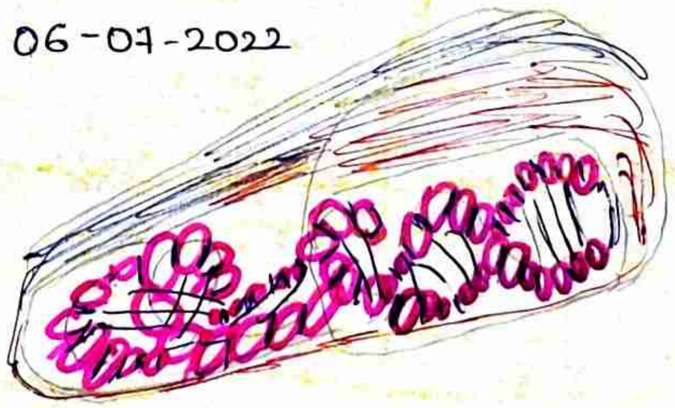
Ist year IInd Sem

Topic : Electrode

Guided by : G. Jyothi
Department of chemistry.

Date : 06-07-2022



Electrode

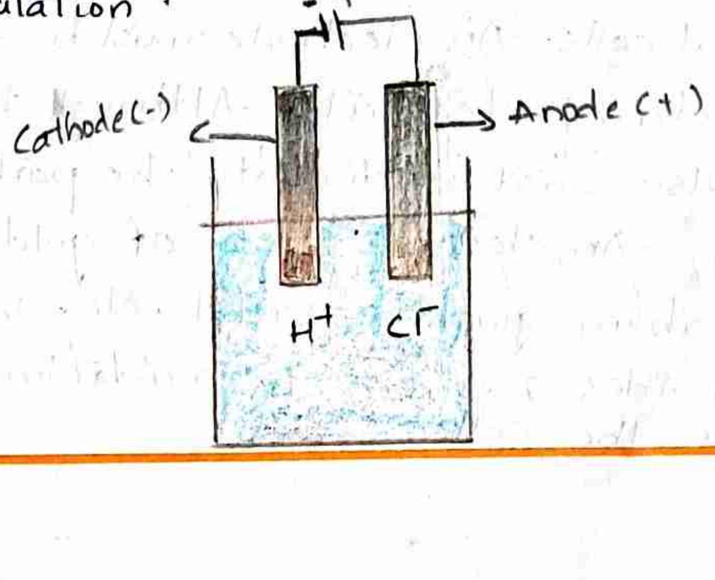
Introduction:

A Conductor used to establish electrical contact with a nonmetallic part of a circuit (or) an element in a semiconductor device that can emits(or) collects or holes or Controls their movements is defined as "electrode."

An electrode by definition is a point where current enters and leaves the electrolyte. When the current "leaves" the electrodes it is known as the "cathode" and when the current "enters" it is known as the "anode."

Electrodes are vital components of electrochemical cells. They transport produced electrons from one half-cell to another, which produce an electrical charge. (This charge is based on electrical charge:)

The charge is based off a standard electrode System (SHE) with a reference potential of 0volts and serves as a medium for any cell potential calculation.



In this cell electrical energy is converted into chemical energy.

The electrodes are connected to a battery then electrons flow from the -ve electrode (Anode of Daniell cell) in to the +ve electrode then this electrode gets -ve charge and it is called <u>cathode</u> :

∴ This will attack H^+ ions.

$$\boxed{2H^+ + 2e^- \longrightarrow H_2 \text{ reduction (cathode)}}$$

The other electrode which is +ve is called <u>anode</u>

∴ This will attack Cl^- ions

$$\boxed{2Cl^- + 2e^- \longrightarrow Cl_2}$$

The complete reaction is

$$\boxed{2H^+ + 2Cl^- \longrightarrow H_2 + Cl_2}$$

The decomposition of electrolyte solution by passing electricity is called as "electrolysis".

Electrodes are the main component of electrochemical cells. An electrode must be a good conductor of electricity. Although inert Electrodes also exist which don't take part in the reaction. An electrode can be of gold, Platinum, carbon, graphite, metal, etc. The electrode provides a surface for oxidation reductions in the cell.

Explanation:-

Cathode and Anode in the Cell:-

In an electroChemical cell, an electrode is referred to as either cathode or anode. The anode can be defined as the Electrode at which electrons leave the cell cell and oxidation takes place while the cathode can be defined as the electrode at which electrons enter the cell and reduction takes place.

Any of the two Electrodes can become either anode or cathode depending on the direction of current through the cell. The electrode that can function as anode in one cell while cathode in another is called bipolar Electrode.

Primary cells are those electrochemical cells in which irreversible reactions occurs; that's why these identities of cathode and anode are fixed.

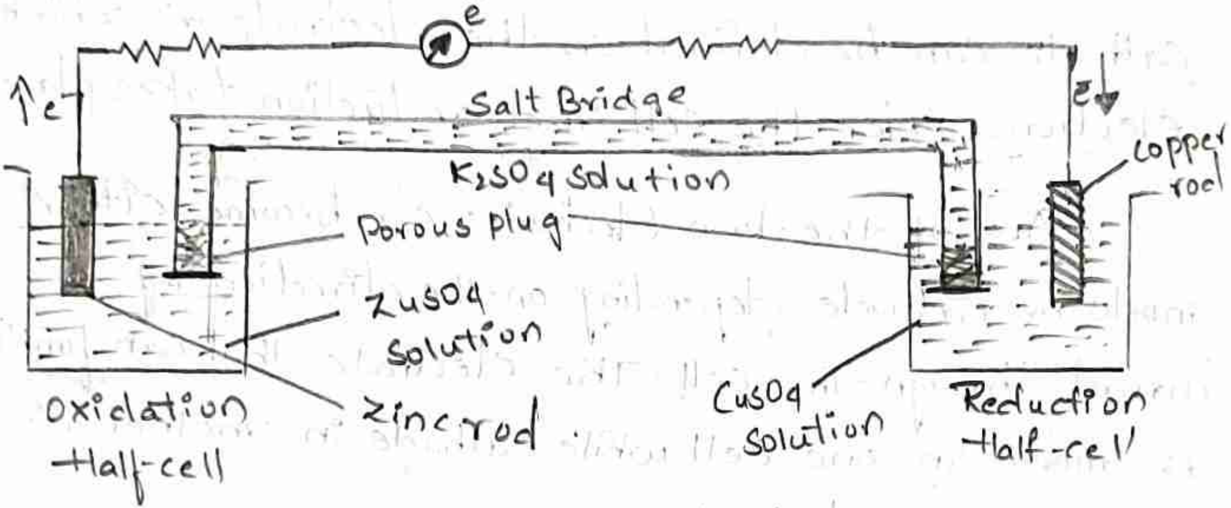
In these cells anode will always be negative or at this point oxidation will occur. While cathode will always be positive or at this rate reduction will occur. Example of a Primary cell is a galvanic cell.

Galvanic Cell:-

-> Galvanic cell is also called as Voltaic cell.

-> This Cell consists of two Chambers/compartments i.e., Zn-plate is dipped in $ZnSO_4$ solution and Cu- Plate is dipped in $CuSO_4$ solution.

-> These two are Connected through ammeter and Salt bridge then current is produced in external circuit.



Secondary cells or electrolytic cells are rechargeable, it means reversible chemical reactions occurs in these cells. In these cells anode is always positive while Cathode is always negative.

Representation of cell notation.

* Anode is written on the left handside, cathode on the right hand side and two are separated by salt bridge indicated by two vertical lines

* Anode half-cell reaction $Zn|Zn^{+2}$

Cathode half-cell reaction Cu^{+2}/Cu

cell : $Zn|Zn^{+2} // Cu^{+2}/Cu$.

Types of Electrodes:

There are four types of electrode; they are:

1. Gas electrode
2. Metal- Sparingly soluble metal salt electrode
3. Metal- metal ion electrodes
4. Redox electrodes.

Gas electrode:

A gas electrode consists of a gas eg: H_2, Cl_2 O_2 in contact with a Solution containing the ions derivable from the gas eg. H^+, Cl^-, OH^-. The Potential of the gas electrode depends upon the concentration of its ion in the Solution and Pressure of a gas.

A gas electrode consists of gas bubbled about inert metal wire immersed in a Solution containing ions with which gas is irreversible. Platinum is used as conductor and to absorb the gas. eg: Standard hydroge electroge 0

SHE is represented as.

$Pt | H_{2(g)} (1\,atm) | H^+_{(aq)} (1M)$.

The half cell reactions are

$2H^+_{(g)} \rightarrow 2H^+_{(aq)} + 2\bar{e}$ (oxidation) L.H.S

$2H^{+}_{(aq)} + 2\bar{e} \rightarrow H_{2(g)}$ (reduction.
(R·H·S)

The electrode potential is arbitrarily assigned zero. This electrode is cation electrode.

chlorine gas electrode :

This electrode is anion electrode. chlorine gas electrode is represented as.

$[Pt | Cl_{2(g)} (1 atm) \mid Cl^{-}_{(aq)} (1M)]$.

The half cell reactions are

"$2Cl^{-}_{(aq)} \rightarrow Cl_{2(g)} + 2\bar{e}$ (oxidation) L·H·S.

$Cl_{2(g)} + 2\bar{e} \rightarrow 2Cl^{-}_{(aq)}$ (reduction R·H·S".

Oxygen gas electrode ;

Oxygen gas electrode is represented as

$Pt | O_{2(g)} (1 atm) | OH^{-}_{(aq)} (1M)$

The half cell reaction is

$4OH^{-} \rightarrow 2H_2O + O_{2(g)} + 4\bar{e}$. (oxidation)·(L·H·S)

$2H_2O + O_{2(g)} + 4\bar{e} \rightarrow 4OH^{-}$ (reduction)·(R·H·S)

Metal - Sparingly Soluble Metal Salt Electrode :

Reversible anion electrode is also called as metal-Sparingly soluble metal Salt electrode. In this electrode a metal, I a sparingly soluble salt of the metal in equilibrium with a solution containing the same anion as the sparingly soluble salt

eg: Calomel electrode.

Metal - Metal Ion Electrodes :

In this case, the metal strip is kept in contact with the solution of a water soluble salt - containing cation of the same metal.

$$\text{eg: } Zn_{(s)} | Zn^{++}_{(aq)}$$

In the electrochemical cell, the electrode having higher oxidation potential undergoes oxidation and the acts as the anode or negative electrode and the electrode having lower oxidation potential undergoes reduction and acts as the cathode or positive electrode.

Examples :- $Zn_{(s)} | Zn^{++}_{(aq)}$

$Zn_{(s)} \rightarrow Zn^{++}_{(aq)} + 2\bar{e}$ (oxidation)

$Zn^{++}_{(aq)} + 2\bar{e} \rightarrow Zn_{(s)}$ (Reduction)

$Cu_{(s)} | Cu^{++}_{(aq)}$

$Cu_{(s)} \rightarrow Cu^{++}_{(aq)} + 2\bar{e}$ (oxidation)

$Cu^{++}_{(aq)} + 2\bar{e} \rightarrow Cu_{(s)}$ (Reduction)

Redox Electrode:

In these electrodes, an inert metal like Pt is dipped in a solution containing ions of an active metal in two different oxidation states

$Pt | Fe^{2+}, Fe^{3+}$

$Fe^{2+} \longrightarrow Fe^{3+} \bar{e}$ (oxidation)

$Fe^{+++} + \bar{e} \rightarrow Fe^{++}$ (Reduction)

$Pt | Sn^{2+}, Sn^{4+}$

$Sn^{2+} \longrightarrow Sn^{4+} + 2\bar{e}$ (oxidation)

$Sn^{4+} + 2\bar{e} \longrightarrow Sn^{2+}$ (Reduction)

Electromotive force (EMF) of cell:

The flow of electricity from one electrode to another electrode in a galvanic cell indicates that the two electrodes have different potential.

The difference of potentials between the electrodes of a cell which causes flow of current from an electrode at higher potential to another at lower potential is known as electromotive force.

The difference of the potential between the two electrodes is called as cell potential (or) EMF of cell

EMF (or) E_{cell} = Oxidation potential of the anode + Reduction potential of the cathode

(or)

= Reduction potential of cathode - Reduction Potential of anode

$$\boxed{E_{cell} = E_{cathode} - E_{anode}}$$

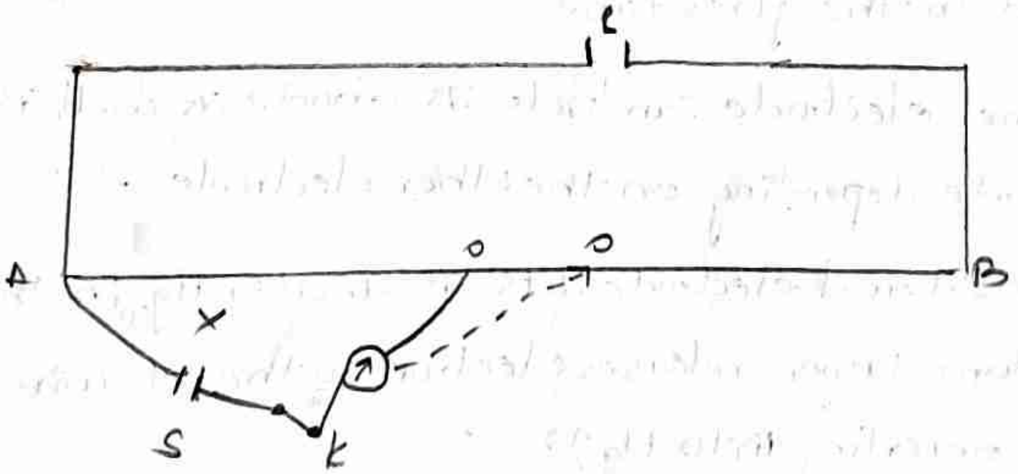
$$\boxed{E_{cell} = E_R - E_L}$$

Where

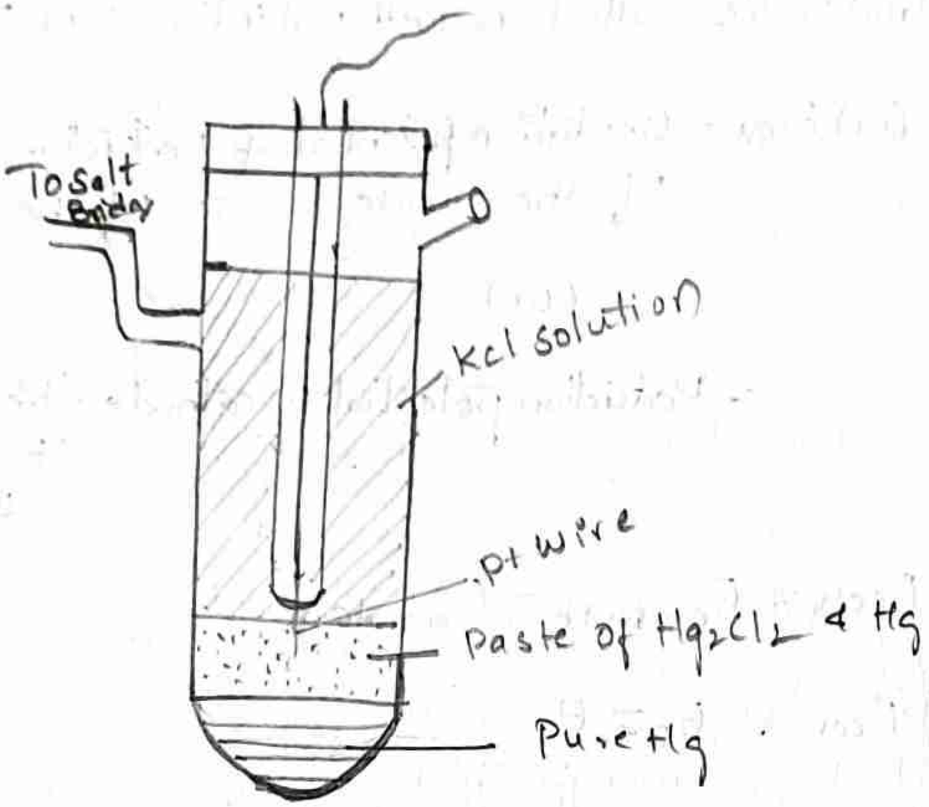
E_{cell} = EMF of cell

E_R = RHS electrode = E^0 of cathode

E_L = LHS electrode = E^0 of anode.



Calomel electrode (secondary reference electrode)



- → Calomel electrode is a secondary reference electrode.
- → This is used for the solution containing Cl^- ions
- → In a glass tube $Hg_{(s)}$ is taken at ~~this~~ its bottom, $Hg_2Cl_{2(s)}$ Paste is covered the Hg-layer and KCl solution is filled in the glass tube
- → Calomel electrode can acts as anode as well as cathode depending on the other electrode.
- → When calomel electrode acts as anode, $Hg_{(s)}$ in the bottom layer releases electron to the Pt-wire by converting into Hg_2^{+2}.

$2Hg \longrightarrow Hg_2^{+2} + 2e^-$

$Hg_2^{+2} + 2Cl^- \longrightarrow Hg_2Cl_2$

$Hg; Hg_2Cl_2 / Cl^- \|$ cathode

→ When calomel electrode acts as cathode, Hg^{+2} ion in Hg_2Cl_2 takes electrons from pt-wire and converted to Hg.

$Hg_2^{+2} + 2e^- \longrightarrow 2Hg$

(or)

$Hg_2Cl_2 + 2e^- \longrightarrow 2Hg + 2Cl^-$

Anode $\| Cl^- / Hg_2Cl_2; Hg$

→ The potential of calomel electrode ~~p~~ depends on the conc. of KCl solution.

Hence, E° of calomel

1) For 0.1M KCl is —— 0.338V

2) For 1M KCl is —— 0.280V

3) For Saturated KCl is —— 0.2415V.

Uses of Electrodes:

- Electrodes are used to make contact between nonmetal components of a circuit in a cell.
- Electrodes are used to measure conductivity.
- These are used in fuel cells in vehicles.

- These are used for medical purposes such as EEG, ECG, ECT and defibrillator.
- These are used for electrophysiology techniques in biomedical research.
- These are used in the execution of electric chair
- These are used for electroplanting, arc welding, grounding.
- These are used in electrochemistry.
- These are used for chemical analysis of Substances, used in membrane electrode assembly, and electroshock weapons.

Conclusion:

From this Electrode project we got to know about the types of electrode and it's uses in our life. How the electrodes not only used in chemistry purpose but also used in Hospitals, welding, electric chair etc. We would like to show our gratitude to our (mam) chemistry madam for giving us such a wonderful project and made us to understand about the importance of Electrode.

GOVERNMENT DEGREE COLLEGE FOR WOMEN, KARIMNAGAR

CHEMISTRY

TOPIC :- Spectral And Magnetic properties of Metal complexes

Submitted To :-

G. Jyothi mam

Department of chemistry.

Submitted By :-

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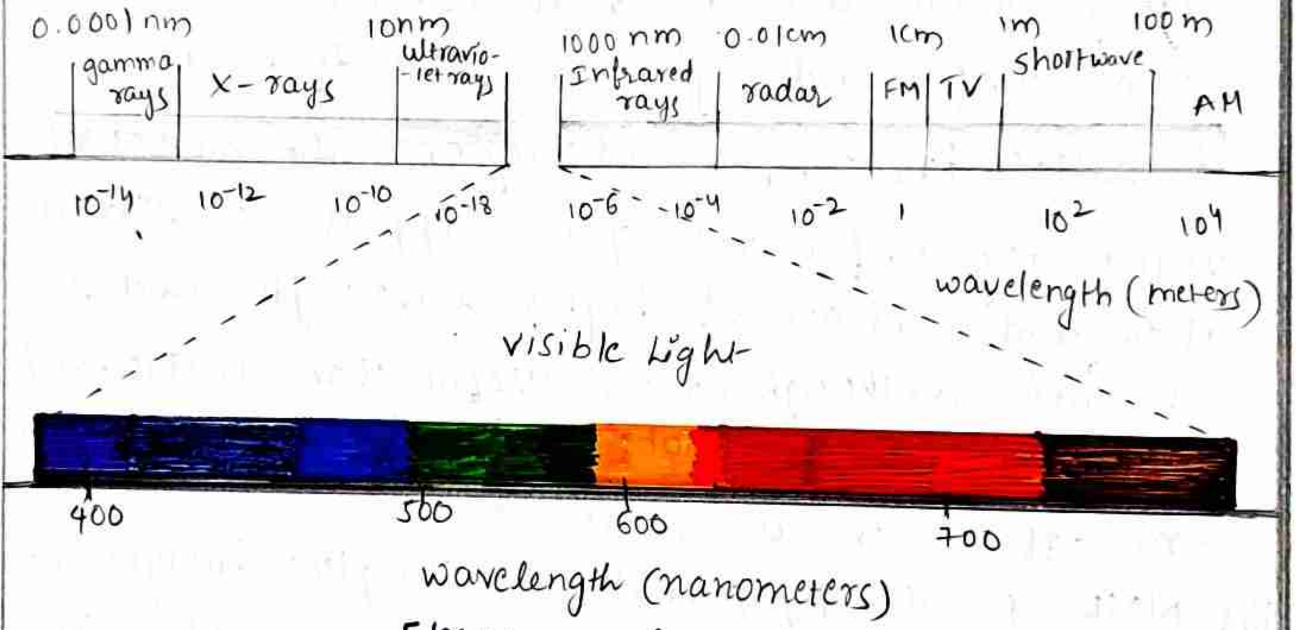
SPECTRAL AND MAGNETIC PROPERTIES OF METAL COMPLEXES

Electromagnetic spectrum and Absorption of Radiations :-

The arrangement of all types of electromagnetic radiations in order of their increasing wavelengths or decreasing frequencies is known as complete "Electromagnetic Spectrum".



Electromagnetic Spectrum

The visible spectrum (from violet to red through rainbow colours) represents only a small portion of the electromagnetic spectrum. If we arrange all types of electromagnetic radiations in order of their increasing wavelengths, then the portion above the visible region is called "Infra-red" while that below it is the ultra-violet region.

Infra-red radiations have longer wavelengths and are thus, less energetic. cosmic rays carry high energy while radiowaves are least energetic. Microwaves have larger wavelengths and are used in telephone transmission

In an electromagnetic spectrum, we may note that,

i) visible and ultra-violet radiations cover the wavelength range from 200-800 μ.

ii) The Infra-red radiations which cover the wavelength range from 0.8 to 2.5 μ constitute near Infra-red region and that from 15-25 μ is called far Infra-red region. The most useful region for Infra-red spectroscopy is 2.5 to 15 μ these radiations are of higher wavelengths and less energetic. Although, more useful than ultra-violet technique, it doesnot reveal fully the environment effects in a molecule.

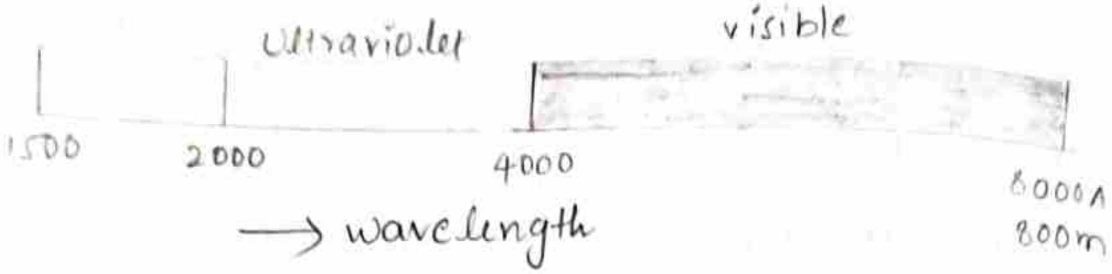
iii) NMR spectroscopy provides a complete insight into the environment and the arrangement of atoms within a molecule. For this technique, radiations of longest wavelength range, i.e Radiowaves are useful. A sample under investigation is placed in a strong magnetic field and irradiative with Radiowaves. Depending upon the strength of the magnetic field employed, radiations of definite wavelength (or frequency) will be absorbed which will bring the nuclear magnets into specific orientations with respect to the applied magnetic field.

Due to the different environmental effects, different magnetic nuclei (say protons, N^{15}, C^{13}, F^{19}, P^{31} atoms etc.) will feel the applied magnetic field differently. Hence absorptions at different field strengths will correspond to different sets of protons or magnetic nuclei. From the UV, Infra-red and NMR spectra of an unknown compound, it is possible to determine its structure.

Summary of the Spectroscopic Techniques

Radiation absorbed	Effect on the molecule of A Substance and information obtained.
Ultra-violet (190-400nm) and visible (400-800nm)	Changes in electronic energy levels within the molecule, conjugated unsaturation, conjugation with non-bonding electrons, extent of π-electron system
Infra-red 667-4000 cm^{-1}	Changes in the vibrational and rational movements of the molecule. Detection of almost all functional groups. which have specific vibrational frequencies such as $C=O$, $O-H$, NH_2, $C\equiv C$ etc.
Radio-frequency. Frequency 600-300 MHZ	Nuclear magnetic resonance, induces changes in the magnetic properties of certain atomic nuclei, notably that of hydrogen (hydrogen atoms in different environments can be detected, counted and analysed for structure determination.

Substances absorbing in the visible range will appe coloured to the human eye. the wavelength of particular radiation absorbed can also be expressed i terms of frequency or energy in Kcl mole-1



$1\mu = 10^{-4}\,cm$

$1m\mu = 1\,nm = 10^{-7}\,cm = 10\,Å$

[∵ nm means nanometers]

Absorption spectra of Metal complexes :-

Many metal complexes are coloured. the reason for this is that they absorb visible radiation and the electronic transition occurs between d-d orbitals. the intensity of light absorbed by the metal complexes is as per Beer-Lambert law. this law relates the absorbance (A) of light by the solution of the substanc and the concentration (C) of the solution. the instrum used to measure the absorbance of the solution is known as spectrophotometer.

Light radiation consisting of different wavelengths belonging to visible region is passed through the experimental solution placed in the spectrophotometer the graph drawn between the wavelengths taken on x-axis and the absorbance on y-axis is known as spectrum the spectrum obtained in this way to some extent

Indicates the absorbing nature of the Substance. this spectrum will be as per the electronic transitions between d-d orbitals of the complex. these d-d electronic transitions depend to some extent on

- ✱ The oxidation state of metal
- ✱ The number of ligands.
- ✱ The nature of ligands
- ✱ the Structure of the complex.

therefore the spectrum of metal complex will help us to know about the energy levels, bond nature and the structure of the complex. generally wavelength (λ) is used in spectra. But in place of this, frequency (ν), wave number ($\bar{\nu}$) are also used. these are all related to each other as shown by the following equations.

$$E = h\nu = \frac{hc}{\lambda} = hc\frac{1}{\lambda} = hc\bar{\nu}$$

where E = energy

h = planck's constant (6.626×10^{-34} J.s)

c = velocity of light (2.998×10^{8} m/s)

ν = Frequency

λ = wavelength (expressed in nm)

$1 nm = 10 A^{\circ}$; $1 A^{\circ} = 10^{-8}$ cm

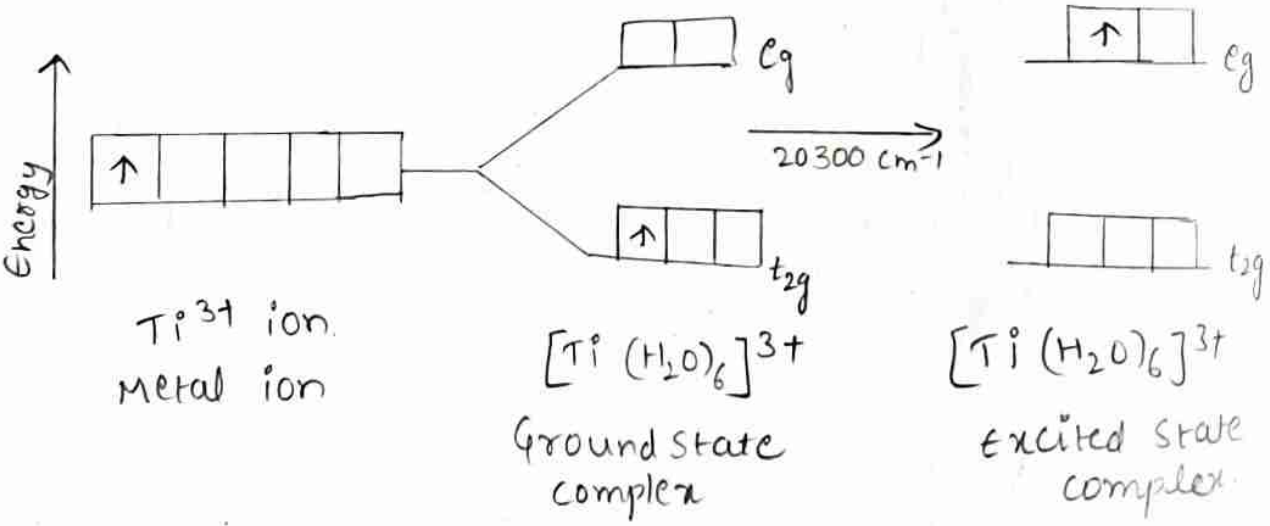
$\frac{1}{\lambda} = \bar{\nu}$ = wave number (cm^{-1})

Electronic Absorption spectrum of $[Ti(H_2O)_6]^{3+}$ Ion :-

Let us examine the d-d transitions in $[Ti(H_2O)_6]^{3+}$ In this metal complex there is one 'd' electron. the 5 degenerated 'd' orbitals of the metal ion Ti^{3+} because of the octahedral geometry of the complex, get split under the field effect of the ligands into lower energy t_{2g} orbitals and higher energy e_g orbitals. the "lone electron" present in the complex, enters into lower energy t_{2g} orbital. this state is called the "**ground state**" of the complex.

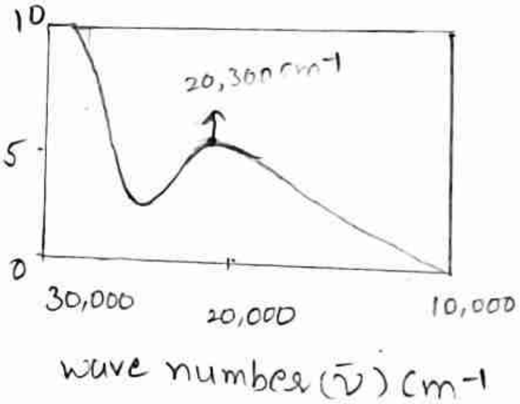
$_{22}Ti$ Electronic configuration in ground state is
$[Ar]\ 3d^2\ 4s^2$

$_{22}Ti^{+3}$ electronic configuration is $[Ar]\ 3d^1$



d-d Transitions in $[Ti(H_2O)_6]^{3+}$

In this complex, the energy difference between t_{2g}, e_g orbitals is 20300 cm^{-1} ($\bar{\nu}$). when light of different wavelengths is passed through the solution, the electron in t_{2g} orbitals absorbs radiation of wave number 20300 cm^{-1} and goes into the higher energy e_g orbital. this means it absorbs additional energy and the eletron in t_{2g} orbital goes into e_g orbital. this is called "d-d" transition. the absorption spectrum resulting out of this process is presented below.



Absorption Spectrum of $[Ti(H_2O)_6]^{3+}$

The steep line corresponding to 27000 – 30,000 cm^{-1} is due to charge transfer spectrum. the light of wave number 20300 cm^{-1} corresponds to the "yellow colour" radiation of the visible region of the eletromagnetic spectrum. therefore this complex absorbs yellow colour and exhibits the complementary colour namely violet colour. therefore $[Ti(H_2O)_6]^{3+}$ will have "violet" colour. thus the violet colour of the complex is explained through d-d transition.

1 KJ/mol = 83.7 cm^{-1} $\therefore$ 20300 cm^{-1} = 243 KJ/mol

the electron occupies 2/5 Δ_0 level. Hence CFSE is

2/5 × 243 = 97 KJ/mol.

the complex containing more than one unpaired 'd' electron will have more d-d transitions. Hence their

Spectra will be more complex. Even then the colou of metal complexes can be explained by d-d tran thus the explaining of the colours of metal comple through d-d transitions can be cited as an applica of crystal field theory to the metal complexes.

colour properties of Transition Elements.:-

Element	**electronic configuration**	**No. of unpaired electrons**	**Colou**
Ti^{3+}	$3d^1$	1	purple
V^{3+}	$3d^2$	2	Green
Cr^{3+}	$3d^3$	3	violet
Mn^{3+}	$3d^4$	4	violet
Fe^{+3}	$3d^5$	5	yellow
Mn^{+2}	$3d^5$	5	Pale pink/
Co^{+2}	$3d^6$	4	Green
Ni^{+2}	$3d^7$	3	pink
Cu^{+2}	$3d^8$	2	Green
Zn^{+2}	$3d^{10}$	0	colourles
Sc^{+3}	$3d^0$	0	colourles
Cu^{+1}	$3d^{10}$	0	colourles

$FeSO_4$ is in dirty yellow.

Absorbed Light	Transmitted light/ (complementary colour)
violet	Greenish yellow
Indigo	yellow
Blue	orange red
Green	pink
yellow	Indigo
Orange	Blue
Red	Bluish green
Green-Blue	Purple
Green-yellow	violet
Purple	Green

Types of Magnetic Behaviour :-

- Paramagnetic
- Diamagnetic
- Ferromagnetic
- Anti ferro magnetic.

The magnetic property exhibited by a substance depends on the arrangement of the atoms, or molecules, or ions present in the substance and also on the number of unpaired or paired electrons in them. The magnetic properties shown by the substance are basically of four types.

Paramagnetic Substance :- If a substance contain one or more than one unpaired electron it exhibits "Paramagnetism". the Substance exhibiting paramagnetism is called paramagnetic Substance. the substances with unpaired electrons behave as magnetic poles. the substances containing these magnetic poles when placed in external magnetic field, the magnetic dipole moments of the unpaired electrons in the substance arrange themselves parallel to each other in the direction of magnetic field. therefore the substance containing unpaired electrons is attracted towards magnetic field and exhibits paramagnetism.

Ex :- V^{3+}, Cu^{2+}, Gd^{3+}

Diamagnetic property :- If a Substance has only all paired electrons, it exhibits diamagnetism. Since all substances contain electron pairs, they all exhibit diamagnetism. Diamagnetism is a universal magnetic property of all substances. If a diamagnetic substance is placed in an external magnetic field, the planes of the electrons lift slightly, magnetism is induced in the substance which acts in the direction opposite to the direction of the external magnetic field.

Ex :- Li^+, Cu^+, Ga^+

Ferromagnetic property :-

If the magnetic poles of adjacent atoms in a paramagnetic Substance are all parallelly alligned in the same direction the substance exhibits ferromagnetism the examples for ferromagnetic substances are Fe, Co, Ni Solids.

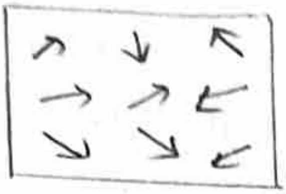
Ferromagnetic Substances exhibit magnetic Susceptibility in the range 10^6. this is because of the allignment of magnetic moments of atoms. this arrangement of magnetic moments is disrupted with rise in temperature the parallel arrangements of magnetic moments changes. at a particular temperature, the ferromagnetic Substance becomes continu paramagnetic substance. this temperature is called "Curie Temperature" or "Curie point". After this temperature the arrangement of magnetic moments is not in Order.

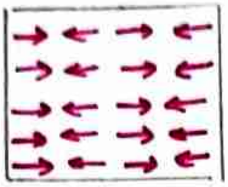
Anti ferromagnetic property :- If the magnetic dipoles of the adjacent atoms in a Substance are arranged anti parallel to each other, the resultant magnetic moment becomes zero. this is known as anti ferromagnetism.

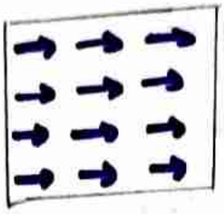
Ex:- MnO, MnS, FeO etc.

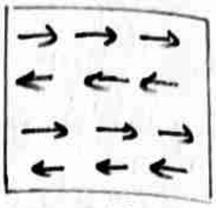
the anti ferromagnetism first increases with temperature. After a particular temperature, it becomes paramagnetic. this temperature is called "Neel point" or "Neel Temperature". Below Neel temperature the reason for the increase in magnetism of anti ferromagnetic Substance is, the anti parallel arrangement of magnetic dipoles returns to the parallel arrangement of magnetic dipoles.

Arrangement of magnetic dipoles


Paramagnetic Substance


Diamagnetic Substance


Ferromagnetic Substance


Antiferromagnetic Substance

Spin moment (only) formula

the paramagnetic property of a substance is caused by the unpaired electrons in it. the electron spins on its own axis and causes spin moment, similarly electrons move in orbits and cause orbital moment. the spin moment electron is natural. But the orbital moment changes with the situation. Now let us consider how the spin moment of an electron is calculated in paramagnetic substances.

the electron magnetic moment (μ) caused by unpaired spinning electron is calculated by the following eqn.

$$\mu = g\sqrt{S(S+1)}$$

$\therefore$ g = gyroscopic magnetic factor (ratio). Its value is 2.

S = Spin quantum number

this equation is called "Spin only formula."

the magnetic moment of a paramagnetic substance containing more than one unpaired electron is calculated by the equation $\mu = \sqrt{n(n+2)}$ $\therefore$ n = no. of unpaired e⁻s

Both the equations are equivalent. From the above eqn it is clear that as the spin quantum number increases, or the number of unpaired electrons increases, the magnetic moment value increases. In transition elements the number of unpaired electrons may be 1, 2, 3, 4, ... 7. ..//

Conclusion :-

The Spectral and magnetic properties of Metal complexes exhibited by a Substance depends on the arrangement of the atoms, or molecules, or ions present in the Substance and also on the "number of unpaired" or "paired electrons" in them.

The colour of the complex is explained through d-d transition. The complex containing more than one unpaired 'd' electron will have more d-d transitions. Hence their spectra will be more complex.

Many metal complexes are coloured. The reason for this is that they absorb visible radiation and the electronic transition occurs between d-d orbitals.

GDCW KARIMNAGAR.

STUDY PROJECT

on

Properties of Coordination Compounds

Name of the Supervisor:- G. Jyothi mam

Students:- M. Sahalya
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Topic :- Colour properties of transition element / co-ordination Compounds & their uses

&

(CFT)

Introduction :-

CRYSTAL FIELD THEORY (CFT)

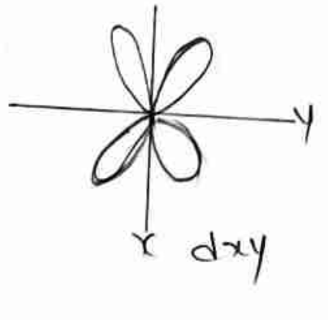
* This theory was advanced by bethe & van Vleck & it is applied mainly to ionic crystals According to CFT

1) The interaction b/w metal atom / metal ion & ligand is purely electrostatic / 100% ionic

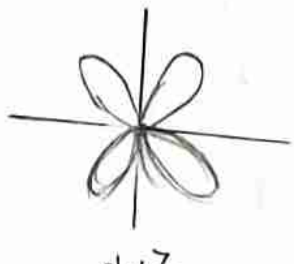
ligands are treated as point charges

The d-orbitals on the metal all have the same energy (that is degenerate) in the free atom.

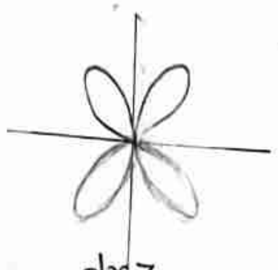
In these 5-d-orbitals, 3 orbitals such as dxy, dyz, dzx are lying in b/w axes & dx²-y2 & z² are along the axes.



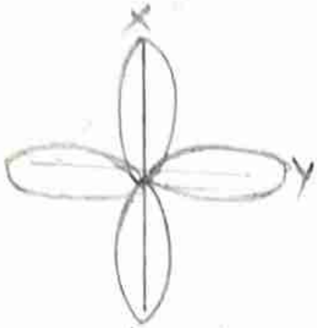
dxy



dyZ



dxZ



$d_{x^2-y^2}$.

d_{z^2}

* when a Complex is formed the ligands destroy the degeneracy of these orbitals.

* when ligands approching the metal ion, repulsion b/w those orbitals.

* This is known as crystal field splitting.

* Due to this splitting, d-orbitals of higher energy & lower energy are formed

* The difference b/w these 2 Energy levels is known as crystal field stabilisatn energy (CFSE)

Colour properties of transition elements :-

Whenever light falls on the transitn element Compounds electrons excite & electrons absorb Energy & excite when these electrons de-excite they release visible light wavelength.

- That is why transition element compounds exhibit colour.

* They are Good Conductors of heat & electricity.

* They can be hammered | bent into shape easily

* They have high melting points (but mercury is a liquid at room temperature).

* They are usually hard & tough

* they have high densities

One of the remarkable properties of transition elements is their Colour.

It has been seen that most of the transition metal Compounds show particular Colours.

This means that some visible spectra are absorbed by these elements from white light as it passes through a sample of transition metals.

when transition ~~men~~ elements are not bonded to anything else their d-orbitals are degenerate that is, they all have the Same Energy level.

when they start bonding with other ligands, due to different Symmetries of the d-orbitals & the inductive Effects of the ligands on the electrons, the d-orbitals split apart & become non-degenerate.

when an electron jumps from lower energy d-orbital to higher energy d-orbitals, that is d-d transition, the energy of excitation corresponds to the frequency of light absorbed.

Thus, the energy required by the electron for a change is provided by the light waves

The frequency of of light wave is observed to be visible range.

The frequency of light absorbed/(to be invisible range) to depends on the nature of the ligands.

Factors effects the Colour of transition metal ions :-

There are 3 Important factors that impact Color to transition metal Complexes

① They are nature of the ligands
② oxidation state of the metal
③ The Geometry of the Complex.

Colour properties of Coordination Compounds :-

Coordination Compounds generally display a variety of distinctive physical & chemical properties

Such as colour, magnetic susceptibility, Solubility & volatility, an ability to undergo oxidation-reduction reaction & Catalytic activity.

The color for a coordinatn Complex. Can be predicted using the crystal field theory (CFT).

Knowing the colour can have a no. of useful applications, such as the creation of pigments for dyes in the textile industry.

The tendency for Coordination Complexes to display such a wide array of colors is merely coincidental;

their absorption energies happen to fall within range of the visible light spectrum.

chemists & physicists often study the colour of a substances not to understand its sheer appearance, but because colour is an indicator of a chemicals physical properties on the atomic level.

Colors of Coordination Compounds :-

Coordination Compounds of transition metals with weak-field ligands are often blue-green, blue, or indigo because they absorb lower-energy yellow, orange / red light

Ex :- 24.7.2 : matching Colors to ligand fields.

Ex :-

Coordination Complexes of Titanium Sulphate :-

Titanium sulfate is the inorganic compound with the formula $TiOSO_4$.

It is a white solid that forms by treatment of titanium dioxide with fuming sulfuric acid.

It hydrolyses to a gel of hydrated titanium dioxide.

white, hygroscopic solid. titanium sulfate is used to make titanous sulfate.

It is used as a mordant in dyeing physical & chemical properties :

Decomposes in water to form a strongly acidic so...

melting point : 28.3c

Boiling point : 283c

Density 1.47g/ml.

Titanium (III) sulfate is used in the manufacture of bulk, large scale chemicals (including petroleum products) fine chemicals, basic metals, including alloys, computer, electronic & optical products, electrical equipment.

It is also used as a biochemical for proteomics research.

It is a chemical intermediate.

In its elemental form, titanium has a silvery grey-white metallic appearance.

Titanium's properties are chemically & physically similar to zirconium,

Titanium sulphate chemical properties :-

Green, crystalline powder.

Insouble in water, alcohol, cocentrated sulfuric acid.

Souble in dilute hydrochloric acid / sulfuric acid....

39664 Titanium(III) sulfate, 20% in 1-4% sulfuric acid-

Alfa Aesar :-

Titanium (III) sulfate is used in the manufacture of bulk large scale chemicals (including petroleum products), fine chemical, basic metals....

Application :- Titanium (III) sulfate is used in the manufacture of bulk, large scale

Formula :- $Ti_2(SO_4)_3$

Formula weight :- 383.38.

Example 2 :-

Copper sulfate

Bluestone / Blue vitriol are 2 names for Copper sulfate.

Because it is an inorganic salt that we use for dyeing. It is an excellent dyeing agent.

Similarly, it functions as a catalyst in a few organic processes.

It is mostly used as a fungicide to treat diseases of fruits & vegetables.

Copper Sulphate formula :

Copper Sulphate is a chemical substance that can refer to as either Cuprous Sulphate (Cu_2SO_4).

$CuSO_4$ is known scientifically as Copper (II) Sulphate.

But it is commonly known as blue vitriol, Roman vitriol, Copper vitriol & bluestone.

Copper (II) Sulphate is a hydrated blue solid. It is attached to water molecules

This becom whitish when anhydrous when it is not molecularly bound to.

Crystallization of Copper Sulphate :

It is a process in which the structure in solution in the form of crystal.

Crystallization of Copper Sulphate refers to the process in which Copper Sulphate is heated at minimum temperature.

HARD & SOFT ACIDS & BASES (HSAB)

Lewis acids & bases are classified as hard & soft acids & bases,

HARD ACIDS (HA) :- The ions (or) molecules which have small atomic size, a high positive charge & have no electron which are easily polarised are hard acids

Ex :- H^+, Li^+, Na^+, K^+, Be^{+2}, Mg^{+2}, Ca^{2+}, BF_3 + $AlCl_3$

Soft Acids (SA) :- The ions (or) molecules which have large atomic size, carries a low positive charge & are easily polarised are soft acids

Ex :- Pd^{2+}, Cd^{2+}, Pt^{2+}, Hg^{2+}, Ag^+, B_2H_6, RS^+, I_2, Br_2

Hard Bases (HB) :-

The ions (or) groups which donate electrons easily has low size & difficult to polarised & Hard Bases.

Ex :- H_2O, NH_3 – OH^-, F^-, Cl^-, CO_3^{2-}, NO_3^-

Soft Bases :- The ions / groups which have a high size & easily polarised are called the soft base.

Ex :- R_2S, RS^-, I^-, SCN^-, R_3P, RNC, R^-, H^-, CO....

Importances :-

Crystal field theory (CFT) is a bonding model that explains many imp properties of transition metal complexes including their colour, magnetism, structure, stability, & reactivity.

The central assumption of CFT is that mental ligand interaction teractions are purely electrostatic in nature.

Copper II

Uses :-

Copper sulphate uses :- Copper sulphate is used in as a fungicide, lgacide, root killer, & herbicide in both agriculture & non-agricultural settings.

It is also used as an antimicrobial & molluscicide uses for ndividual products containing Copper Sulphate vary widely.

FT uses :- CFT is used to extract thermodynamic properties (crystal field stabilization energies) from optical spectral. f minerals & other substances.

Conclusion :-

Coordination Compounds are used as catalysts for many industrial rocesses & have many applications in qualitative / quantitative chemical analyses with within analytical chemistry.
The of coordination compounds has imp in biological system the coordination compounds play a vital role in metallurgy & medicine

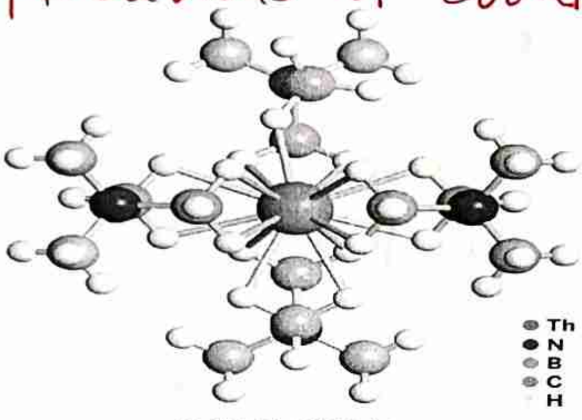
Government degree college for Women

Karimnagar

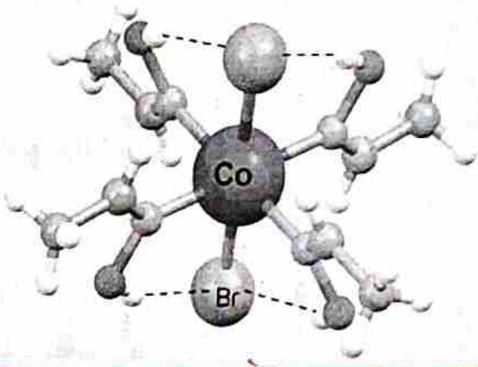
Department of chemistry

Student study Project

Applications of coordination compounds.



$Th[(H_3B)_2N(CH_3)_2]_4$



Name of the supervisor : Jyothi Mam

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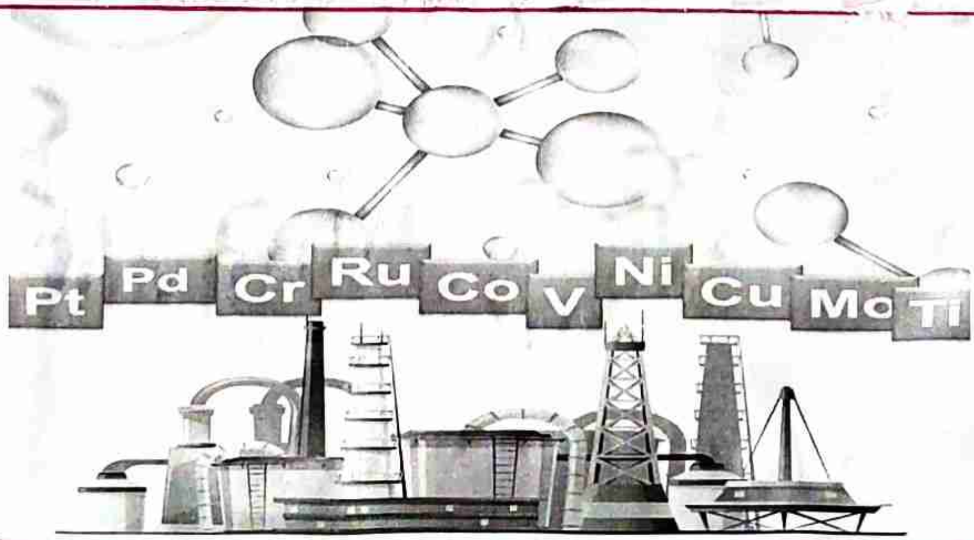
Group : Bsc "Bzc"

H.T. no : 20077164445130



Topic : Application of Co-ordination Properties

co-ordination Compounds have a wide range of chemical reactivity. they can be involved in both inner-sphere and outer-sphere electron transfer reactions. Complex Compound containing certain ligands have the ability to catalyze or stoichiometrically help in the transition of Molecules.

Co-ordination Properties:-

co-ordination Properties are a type of Compound that belongs to the Complex compound class. This is due to the chemistry involved with these molecules. Transition Metals have the unique ability to generate co-ordination properties. This is because of the high charge-to-mass ratio and the availability of d-orbitals

Co-ordination chemistry developments have Produced a variety of complex chemical that we employ in a variety of sectors. co-ordination chemicals are widely used in a variety of sectors. These include naming a few, Mining and Metallurgy, Medical sciences, and so on.

The existence of unpaired electrons that absorb light in their electronic transitions colours the co-ordination compounds created by the transition elements. Complexes containing iron (II) might be green or pale green in colour, whereas co-ordination properties containing iron (III) are brown or yellowish-brown in colour.

Importance of Co-ordination Properties

Co-ordination compounds, such as the $FeCl_4^-$ ion are so named because they contain ions or molecules that are linked to, or co-ordinated with, a transition metal, because they are Lewis acid-base complex ions or co-ordination properties. Ligands are the ions or molecules that bind to transition-metal ions to generate these complexes. The co-ordination no. is the number of ligands attached to the transition metal ion. A co-ordination complex is any of a class of chemicals with chemical structures in a central metal atom is surrounded by nonmetal atoms or groups of atoms known as ligands.

Applications of co-ordination compounds:

There is a high significance of complex compounds in quantitative and qualitative analysis. The use of the most of the organic reagents in inorganic analysis is based on the formation of complex.

1. Separation of silver and mercury:- Silver ions are precipitated as silver chloride which is soluble in NH_3 due to the formation of silver ammonia complex.

$$Ag^+ + Cl^- \longrightarrow AgCl \downarrow$$

$$AgCl + 2NH_3 \longrightarrow [Ag(NH_3)_2]Cl$$ it is soluble in water

2. Separation of copper and cadmium: When copper and cadmium react with KCN to form corresponding sulphate precipitates

$$CuS + 2KCN \longrightarrow Cu(CN)_2 + K_2S$$

$$2Cu(CN_2) \longrightarrow Cu_2(CN)_2 + C_2N_2$$

$$Cu_2(CN)_2 + 6KCN \longrightarrow 2K_3[Cu(CN_4)_4]$$

$$CdCl_2 + 2KCN \longrightarrow Cd(CN)_2 + K_2S \text{ (or) } 2KCl$$

$$Cd(CN)_2 + 2KCN \longrightarrow K_2[Cd(CN)_4]$$

3. Separation of cobalt and nickel: When chloride salts of cobalt and nickel are treated with KCN to form cobalt cyanide and nickel cyanide precipitates

$CoCl_2 + 2KCN \rightarrow Co(CN_2)\downarrow + 2KCl$

$Co(CN)_2 + 4KCN \rightarrow K_4[Co(CN)_6]$

$NiCl_2 + 2KCN \rightarrow Ni(CN)_2\downarrow + 2KCl$

$Ni(CN)_2 + 2KCN \rightarrow K_2[Ni(CN)_4]$

4. Separation of zinc and Manganese :- Adding of NaOH to the salts of Zn and Mn form their corresponding precipitates.

$ZnCl_2 + 2NaOH \rightarrow Zn(OH)_2 + 2NaCl$

$Zn(OH)_2 + 2NaOH \rightarrow Na_2ZnO_2 + 2H_2O$

$MnCl_2 + 2NaOH \rightarrow Mn(OH)_2\downarrow + 2NaCl$

$2Mn(OH)_2 + (O) \rightarrow Mn_2O_3\downarrow + 2H_2O$

5. Separation of calcium and strontium : When excess of ammonium sulphate is added to Ca^{2+} and Sr^{2+} salts, their corresponding precipitates are formed

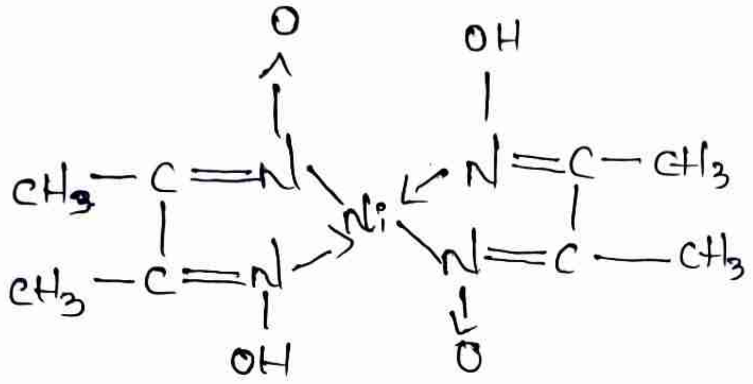
$SrCrO_4 + (NH_4)_2SO_4 \rightarrow SrSO_4\downarrow + (NH_4)_2CrO_4$

$CaCrO_4 + (NH_4)_2SO_4 \rightarrow CaSO_4 + (NH_4)_2CrO_4$

$CaSO_4 + (NH_4)SO_4 \rightarrow (NH_4)_2[Ca(SO_4)_2]$

6. Role of Complexes in quantitative analysis:

Dimethyl oxime is used to estimate the amount of Ni by quantitative technique.



Uses of co-ordination Properties:

Co-ordination Compounds are used in hydrometallurgical Processes for the extraction of Metals such as nickel. cobalt, and copper from their ores and in important catalytic processes to bring about polymerization of organic compounds such as polyethylene and polypropylene.

Ex :- Dyes and Pigments, co-ordination Compounds have been used from the earliest times as dyes and Pigments, for ex :- Madder dye which is red, was used by the ancient greeks and others

* Analytical chemistry, synthetic detergents, chemotherapy

Conclusion :-

co-ordination compounds are used as catalyst's for many industrial processes and have many applications in qualitative/quantitative chemical analysis within analytical chemistry.

The al co-ordination compounds has important in biological system the co-ordination compounds pay a vital role in metallurgy and medicine.

Department of Chemistry

Student Project.

Topics:- Chlorophyll.
Photosynthesis

Name of supervisor:
Jyothi

Name of the student.
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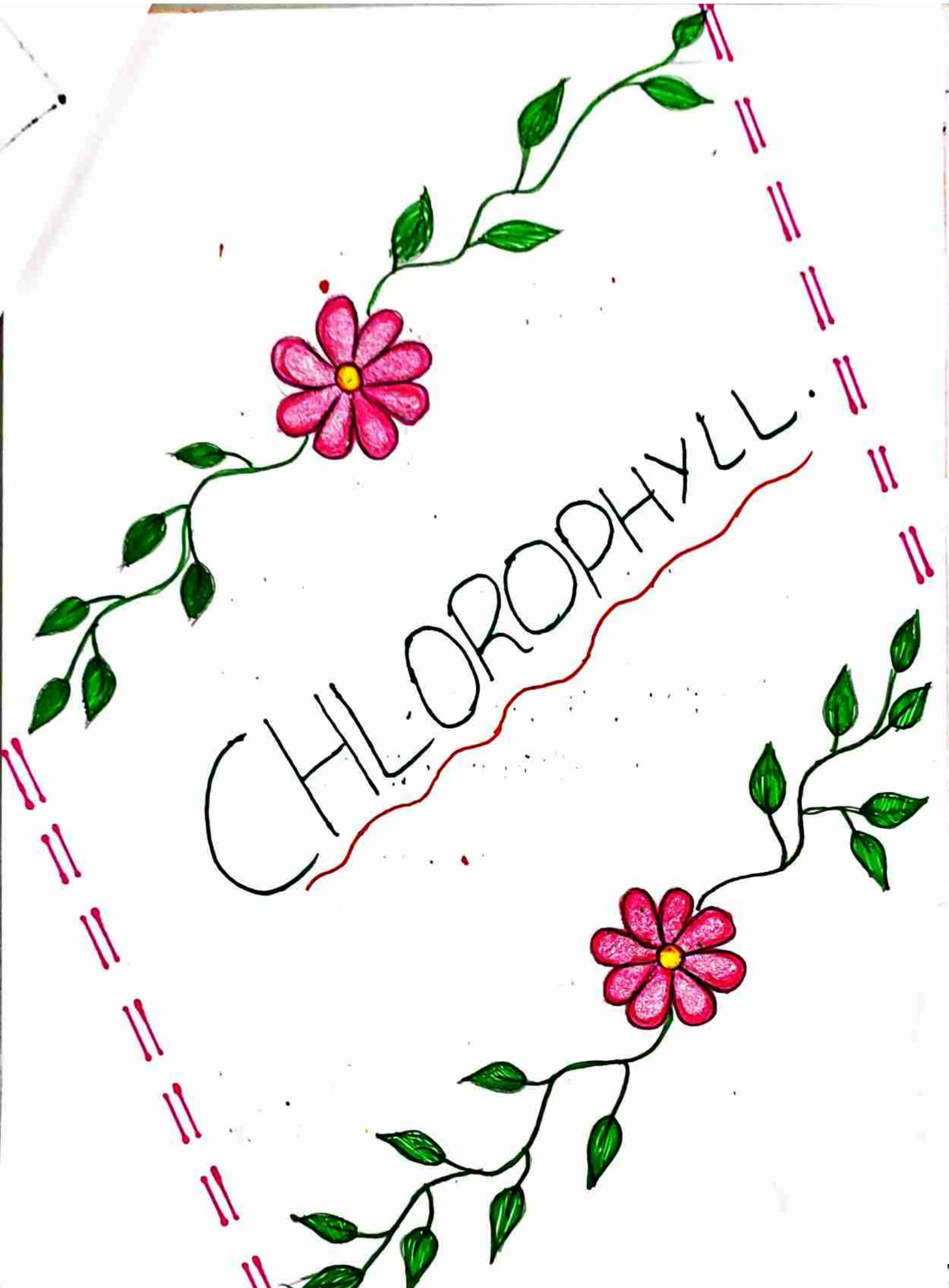


CHLOROPHYLL.

Chlorophyll definition:

A green pigment, present in all green plants and in cyanobacteria, which is responsible for the absorption of light to provide energy for photosynthesis.

chlorophyll is any of several related green pigments found in the mesosomes of cyanobacteria and in the chloroplast of algae and plant. its name is derived from the greek words χλωρός, khloros and φύλλον, phyllon, chlorophyll allow plant to ~~asbort~~ absorb energy from light.

Structure of chlorophyll.

Chlorophyll is a chlorin pigment, related to the porphyrin containing iron compound know as heme. at the centre of the ring is a magnesium ion. the side vary somewhat between the different from of chlorophyll found in different organisms. chlorophyll a is always present, but chlorophyll b and c also occure various groups.

chlorophyll a contains a magnesium ion encased in a large ring structure known as a chlorin. the chlorin ring is heterocyclic compound derived from pyrrole.

Form of chlorophyll.

Chlorophyll consists of two froms, a and b

a. $C_{55}H_{72}O_5N_4Mg$.

b. $C_{55}H_{70}O_6N_4Mg$.

In both cases the Magnesium atom is central in the molecule.

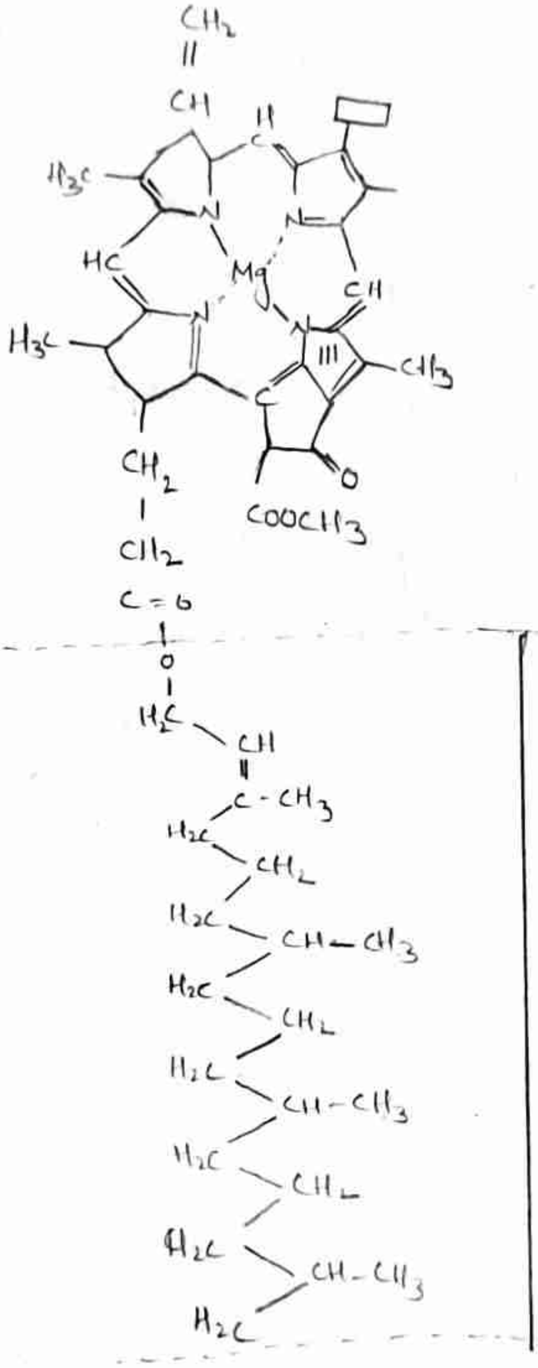
This green pigment is what gives green plants their colour. It is involved in photosynthesis by absorbing Energy from visible light.

Chlorophyll is a green compound found in leaves and green stem of plants initially it was assumed that chlorophyll was a single compound but in 1864 Stokes showed by ~~sep~~ Spectroscopy that chlorophyll was a mixture. If dried leaves are powdered and digested with Ethanol after concentration of the solvent 'crystalline' chlorophyll is obtained but if Ether acetone is used insted of Ethanol the product is amorphous chlorophyll.

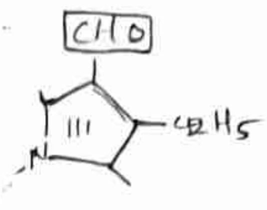
In 1921, Willstatter et al. showed that chlorophyll was a mixture of two compound, chlorophyll-a and chlorophyll-b.

Apart from this fucoxanthin and phycoerythrin are important component of chlorophyll.

Chlorophyll a.



Chlorophyll b.



The two components were separated by shaking a light peth. solution of chlorophyll with aqueous methanol: chlorophyll - a remains in the light petroleum but chlorophyll b is transferred into the aqueous methanol. chlorophyll-a is a bluish - black solid and chlorophyll-b is a dark green solid, both givigen a green solution in organic solutions. In natural chlorophyll there is a ratio of 3to1

The intense green colour of chlorophyll is due to its strong absorbencies in the red and blue regions of the spectrum, shown the below figure. bedause of these absorbencies the light it reflect and tranmits appers green.

	Chlorophyll a.	chlorophyll - b	chlprophyll - c	chlorophyll - d.
Molecular formula.	$C55H72O5N4Mg$	$C55 H70O6N4Mg$	$C35H30O5N4Mg$	$C5H70O6N4Mg$
C_3 group	$-CH=CH_2$	$-CH=C H_2$	$-CH=CH_2$	$-CHO$
C_7 group	$-CH_3$	$-CHO$	$-CH_3$	$-CH_3$
C_8 group	$-CH_2CH_3$	$-CH_2CH_3$	$-CH_2CH_3$	$-CH_2CH_3$
C_{17} group	$-CH_2CH2COO-$ Phytyl	$-CH2CH2COO-$ phytyl	$-CH=CHCOOH$	$-CH_2CH2COO-$ phytyl
$C_{17}-C18$ bond	Single	single	double	Single
occurrence	Universal	Mostly plants	various algae	Cyanobacteria.

Molecular
formula $C_{55}H_{72}O_5N_4Mg$ $C_{55}H_{70}O_6N_4Mg$

Function of chlorophyll.

Due to the green colour of chlorophyll it has many uses as dyes and pigments. it is used in colouring soaps, oils, waxes and confectionary.

Chlorophyll's most impotant use, however, is in nature in photosynthesis. it is capable of channelling the Energy of channelling the Energy of Sunlight into Chemical Energy through the process of photosynthesis. in this process the Energy absorbed by chlorophyll transform carbon dioxide and water into carbohydrates and oxygen

$$CO_2 + H_2O \; (CH_2O) + O_2$$

The chemical Energy stored by photosynthesis in carbohydrate drive biochemical reaction in nearly all living organism.

In the photosynthesis reaction electron are transferred from water to carbon dioxide, that is carbon dioxide is reduced by water. chlorophyll assist this transfer as when chlorophyll absorbs light energy, an electron in chlorophyll is excited from a lower states to higher energy state. In this higher energy state, this electron is more readily transferred to another molecule. This starts a chain of electron-transfer step, which ends with an electron being transferred to carbon dioxide. Meanwhile the chlorophyll which gave up an electron can accept an electron from another molecule. This is the end of a process which starts with the removal of an electron from water.

Simple reactions of chlorophyll.

Treatment of cholorophyll-a with acid remove the magnesium ion replacing ~~ion~~ it with two hydrogen atoms giving an olive-brown solid, phaeophytin-a. Hydrolysis of this splits off phytol and gives phaeophorbide-a. similar compound are obtained if chlorophyll-b is used.

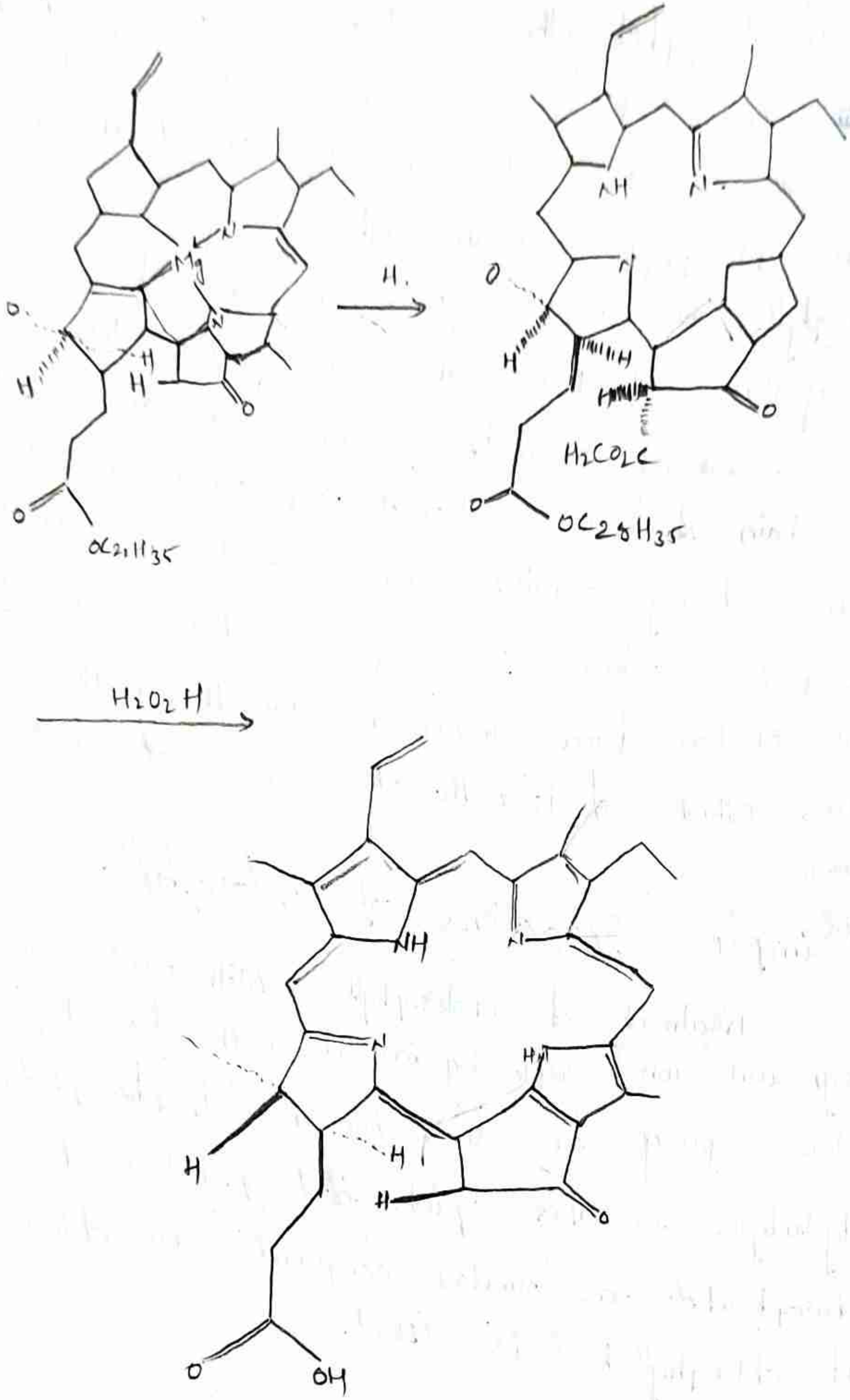
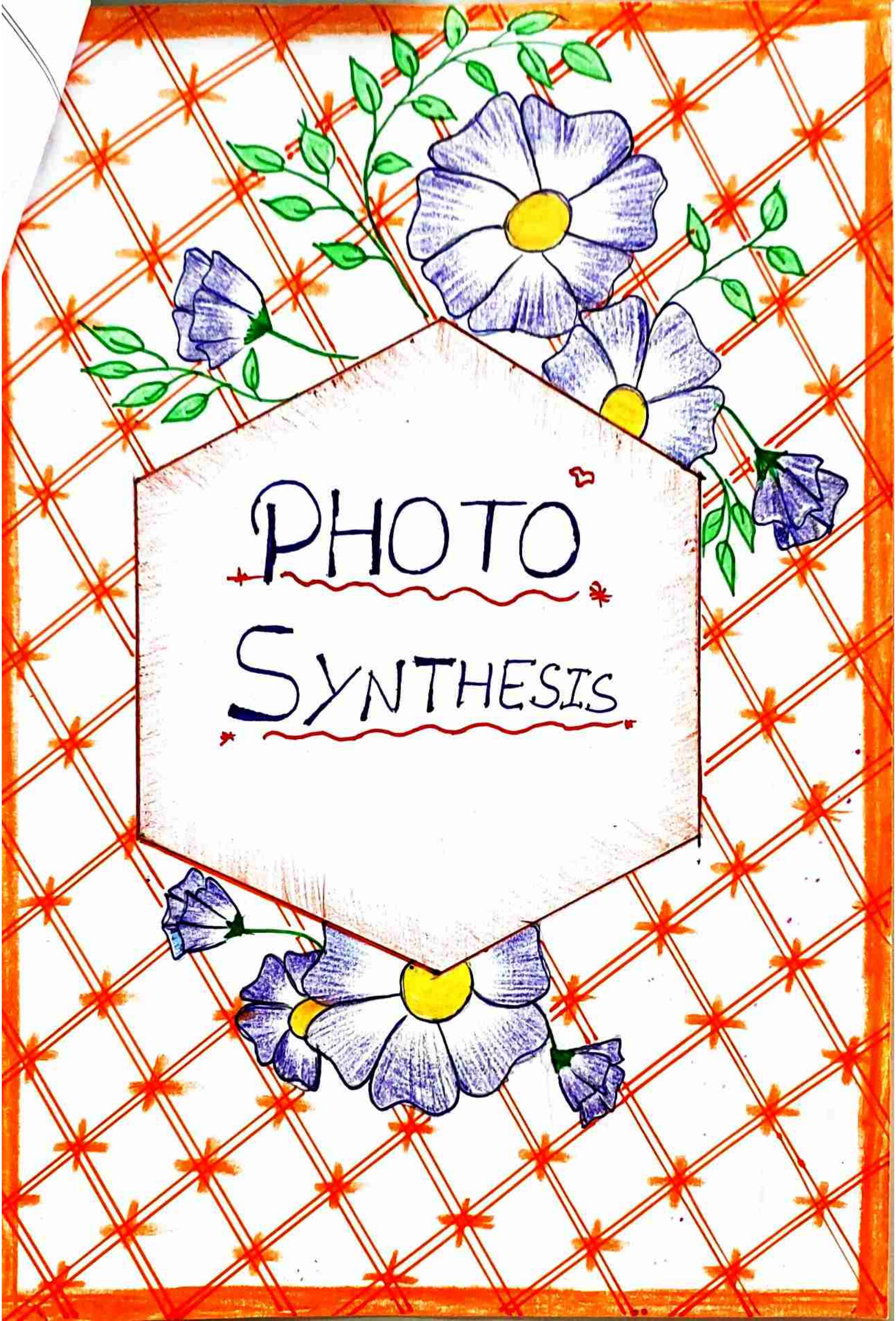

Mg
N
N
N
O
H
H
H
O
O
OC21H35
H.
NH
N
N
O
H
H
H
O
H2CO2C
O
OC28H35
H2O2H
NH
N
N
HN
H
H
H
O
O
OH

PHOTO SYNTHESIS



Photosynthesis:-

Photosynthesis is a process used by plants and other organisms to convert light energy into chemical energy that through cellular respiration. can later be released to fuel the organisms activites. some of this chemical Energy is stored in carbohydrate molecule such as sugars and starches, which are synthesized from carbon dioxide and water hence the name photosynthesis. from the greek phos (φῶς) "light" and Suntheis "putting togther Most plants, alga and cyanobacteria. perform photo synthesis: such organisms are called photoautotrophs. photosy nthesis such organisms are called photoautotrophs. photosy nthesis is largely responsible for producing and maintaining the oxygen content of Earth's atmosphere, and supplies most of the Energy necessary for life on Earth.

Although photosynthesis is performed differently by different Species, the process always beings when energy from light is absorbed by protein called reaction centers that contain green chlorophyll. pigments.

Fixation of CO_2 in photosynthesis - overview of light and dar reaction

→ Chlorophyll absorbs light in the red region from sunlight and converts CO_2 and H_2O to carbohydrates by evolving oxygen gas (O_2). this process is called photosynthesis.

$$6CO_2 + 6H_2O \xrightarrow[\text{Light }(h\nu)]{\text{Chlorophyll}} C_6H_{12}O_6 + 6O_2$$

$$6CO_2 + 12H_2O \xrightarrow[\text{Light }(h\nu)]{\text{chlorophyll}} C_6H_{12}O_6 + 6O_2\uparrow + 6H_2O$$

→ In this reaction, chlorophyll absorbs light energy and passes it to H_2O and CO_2 to the reaction to takes place. hence, photosynthesis is a photosensitised reaction and chlorophyll acts as photosensitiser.

→ Oxygen (O_2) evolved in photosynthesis is from H_2O molecule, but not from CO_2, which was confirmed by tracer technique

$$6CO_2 + 12H_2O \xrightarrow[\cancel{\text{Light}}\text{ sunlight}(h\nu)]{\text{Chlorophyll}} C_6H_{12}O_6 + 6O_2\uparrow + 6H_2O$$

→ In photosynthesis, light energy is converted into chemical energy.

→ chlorophyll also involves in photo phosphorylation where ADP is converted into ATP the addition of one inorganic phosphate ion inpresence of sunlight.

→ In photosythesis, CO_2 is absorbed and O_2 is released. Hence, chlorophyll to maintain

$O_2 \rightleftharpoons CO_2$ Equillibrium in atmosphere.

Photosynthesis mechanism occurs in two reaction

1) Light reaction

2) dark reaction

Light reaction:-

The first phase of photosynthesis involves in light Energy so it is called as light reactions.

→ In light reaction the transfer of electron from water to NADP$^+$ and ADP + Pi connected to from ATP

→ There are four step occur in light phase. They are

(a) Hill reaction.

b) Emerson enhancement Effect

c) photo phosphosphorylation.

d) Oxidative photophosphorylation.

Dark reaction:-

The second phase of photosynthesis involves reduction of carbon dioxide for which light is not required. So it is called dark reaction of photosynthesis

- The dark reactions are first discovered by Black men.

- The reducing power i.e. ATP and NADPH produced in the light reaction are utilised to reduce carbon dioxide

→ The sequence of reaction involving CO_2 fixation and formation of complex carbohydrates is called path of carbon in photo-synthesis

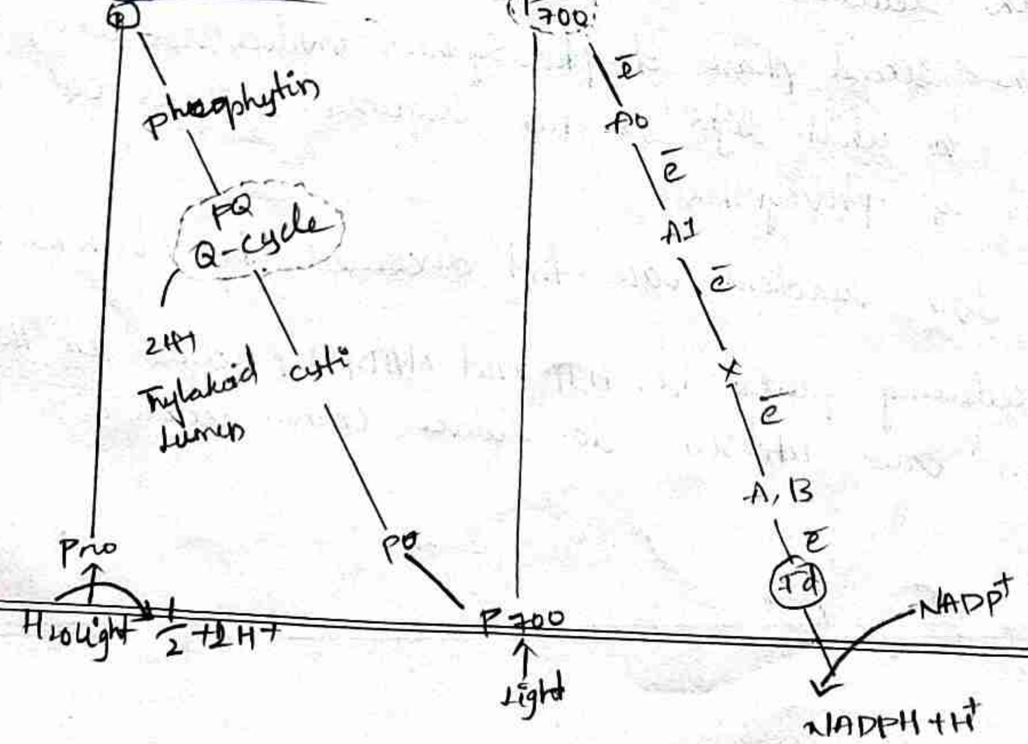
→ Technique used in tracing the path of carbon in radioactive carbon and paper Chromatography.

→ paper chromatography is a technique of separating the photo synthetic compound from a complex mixture of organic compounds

→ The paper Chromatography technique were used by calvin, Benson, Basham and associated to separate isolate and identify the organic compound formed during CO_2 fixation.

→ They used chlorella and secndesmus as experimental materials.

Election transport in light reaction from Water to NADP$^+$



~ Hill and Bendall proposed the scheme of photosynthetic Electron transport.

→ It involves both photo system - I and photo system - I in series connected by electron transport mediators.

→ The process being with the absorition of light Energy by light harvesting Complex.

→ It is transferred to P_{700} by resonance transfer.

→ The light excited P_{700} Expels electron.

Conclusion: From the above information I note that photosynthetic cell Contain ~~chl~~ chlorophyll and other light-sensitive pigments that capture solar Energy. In the presence of carbon dioxide, such cells are able to Convert this solar Energy into Energy-rich organic molecules such as glucose.

GOVERNMENT DEGREE COLLEGE FOR WOMEN, KARIMNAGAR

CHEMISTRY

TOPIC :- CRYSTAL FIELD THEORY [CFT]

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* crystal field theory (CFT) :-

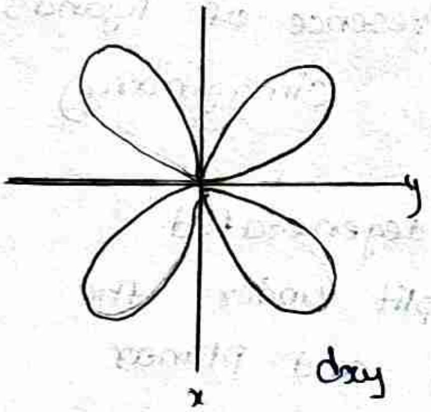
This theory was advanced by bethe and van vleck and it is applied mainly to ionic crystals according to CFT

(i) The intraction between metal atom (or) metal ion and ligand is purely electrostatic (or) 100% ionic

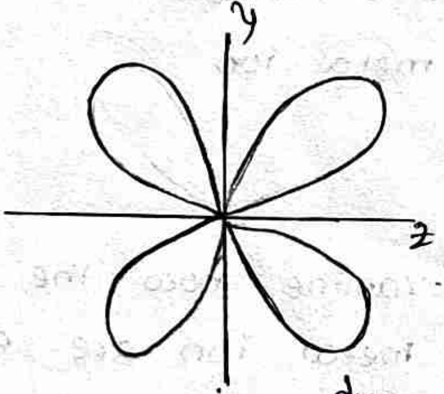
(ii) ligands are treated as point charges

(iii) The d-orbitals on the metal all have the same energy (that is degnerate) in the free atom

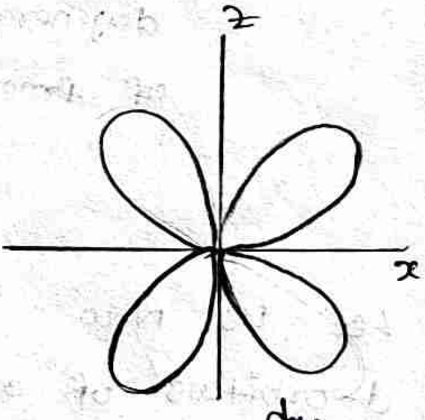
In these five d-orbitals, three orbitals such as d_{xy}, d_{yz}, d_{zx} are lying in between axes and $d_{x^2-y^2}$, d_{z^2} are along the axes.



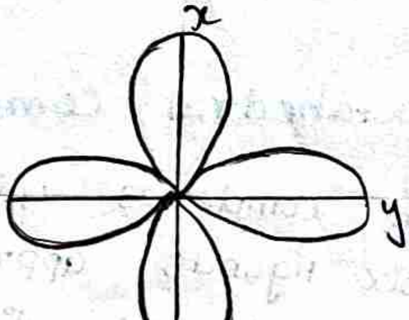
d_{xy}



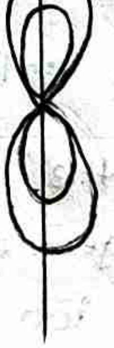
d_{yz}



d_{xz}



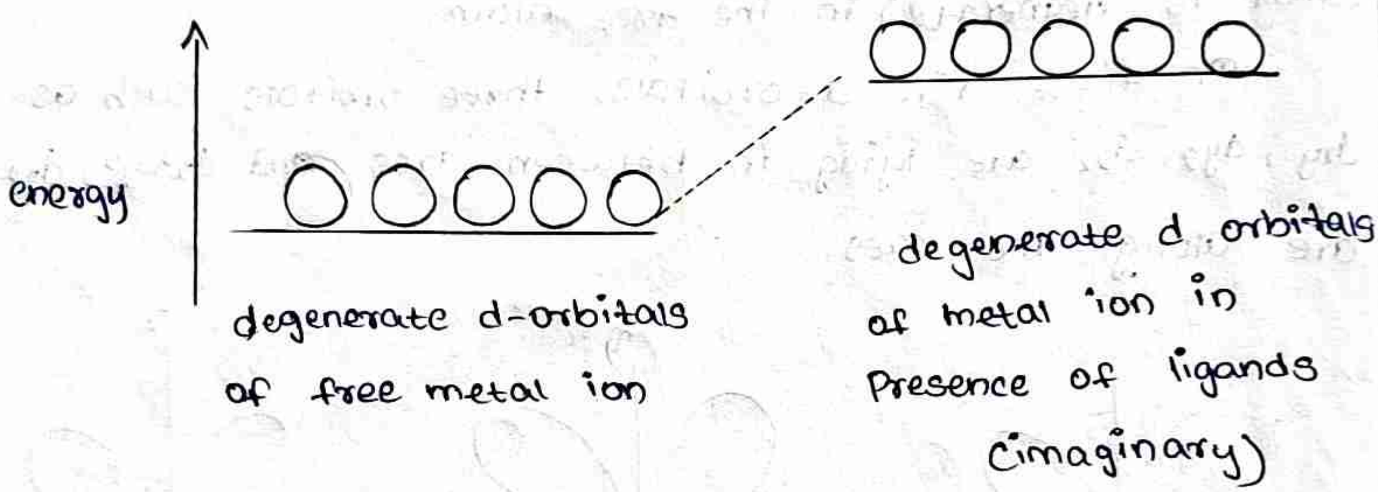
$d_{x^2-y^2}$



d_{z^2}

(iv) When a complex is formed the ligands destroy the degeneraly of these orbitals

(v) When ligands approaching the metal ion, repultion devolped between those orbitals this is known as crystal filed splitting. due to this spitting, d-orbitals of higher energy and lower energy are formed the difference between these two energy levels is known as crystal field stabilization energy (CFSE)



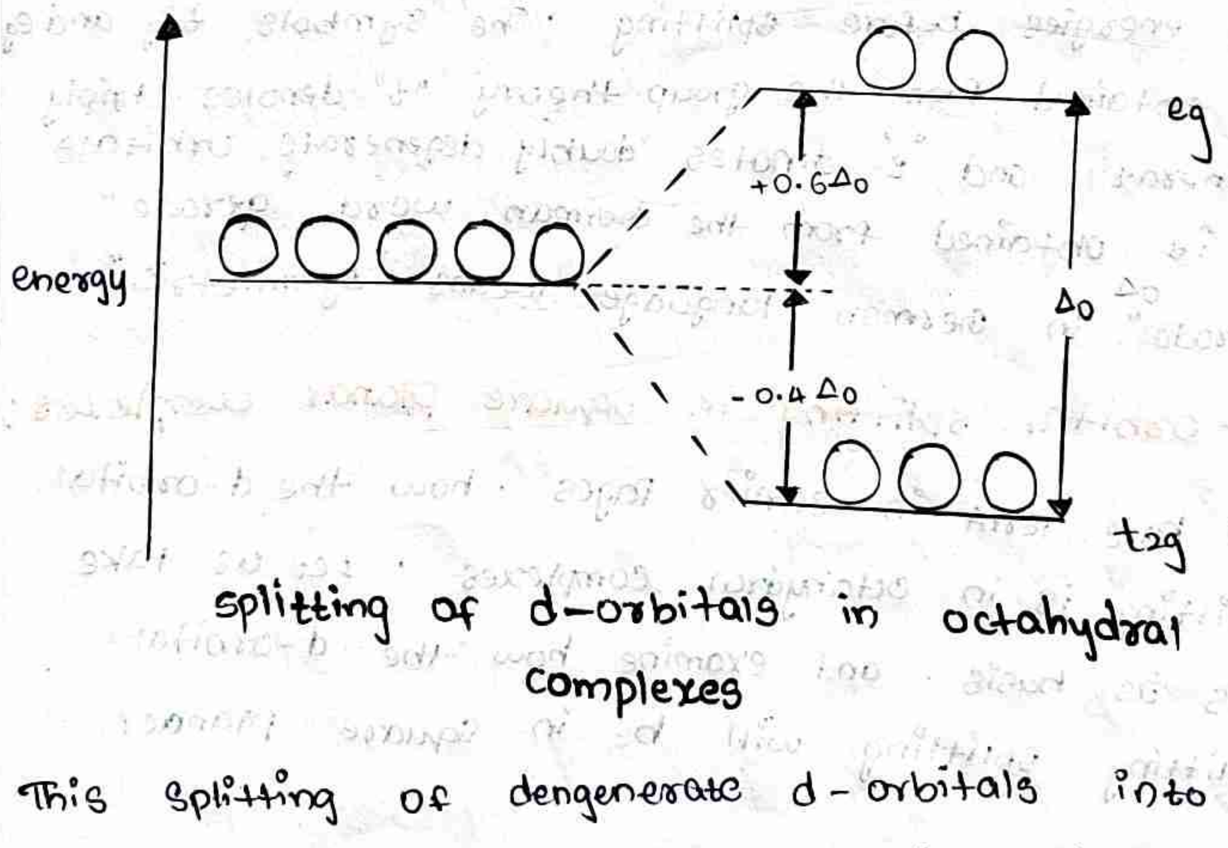
Let us Now examine how the degenerated d-orbitals of a metal ion are split under the influence of octahedral, tetrahedral and planar crystal fields

d-orbital splitting in octahedral complexes :-

* In the formation of complexes with octahedral geometry, the six ligands approach the metal ion along the cartesian coordinates x, y, z Amongst these 6 ligands 2 approch along

x - axis , 2 approach along y-axis and the other two along z axis . since the ligands approach in this field , along the axes , the orbitals oriented along the axes i.e $d_{x^2-y^2}$, d_{z^2} interact (repel) with ligand orbitals and reach the higher energy state

* In contrast to this , the d-orbitals d_{xy}, d_{yz}, d_{xz} are subjected to less interaction (repultion) with the orbitals of the ligand . Hence their energy is relatively lowered in this way the degenerate d-orbitals , of the metal ion are split into higher energy e_g group of orbitals and lower energy t_{2g} group of orbitals.



splitting of d-orbitals in octahydral complexes

This splitting of dengenerate d-orbitals into different groups of orbitals of different energies under the influence of crystal field is called

"Crystal field splitting". This is the most importent aspect of "crystal fied theory" of metal complexes The difference in the energy levels of these two group of d-orbitals. arising as a result of d-orbital splitting is called "crystal field splitting energy" This energy difference is denoted by delta (Δ).

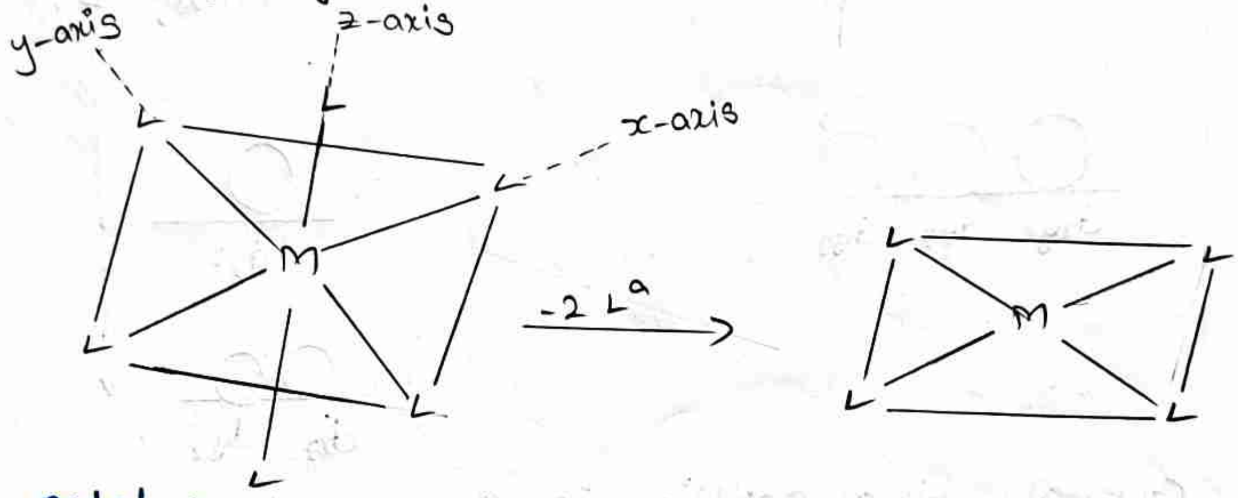
* The difference in energy between t_{2g} and e_g in octahydral geometry is shown by Δ_0. (O= octahedral)

* The energy of e_g orbitals after splitting is incresed by $0.6\,\Delta_0$ and similarly the energy of t_{2g} orbitals is decresed by $-0.4\,\Delta_0$ compared to their energies before splitting. The symbols t_{2g} and e_g are obtained from the group theory "t" denotes triply degenerate and "e" denotes doubly degenerate orbitals "g" is obtained from the German word "gerade" "Gerade" in German language means "symmetric".

d-orbital splitting in square planar complexes:-

We have lernt in earlier pages, how the d-orbital splitting is in octahydral complexes. Let us take this as basis. and examine how the d-orbital splitting splitting will be in square planaer complexes.

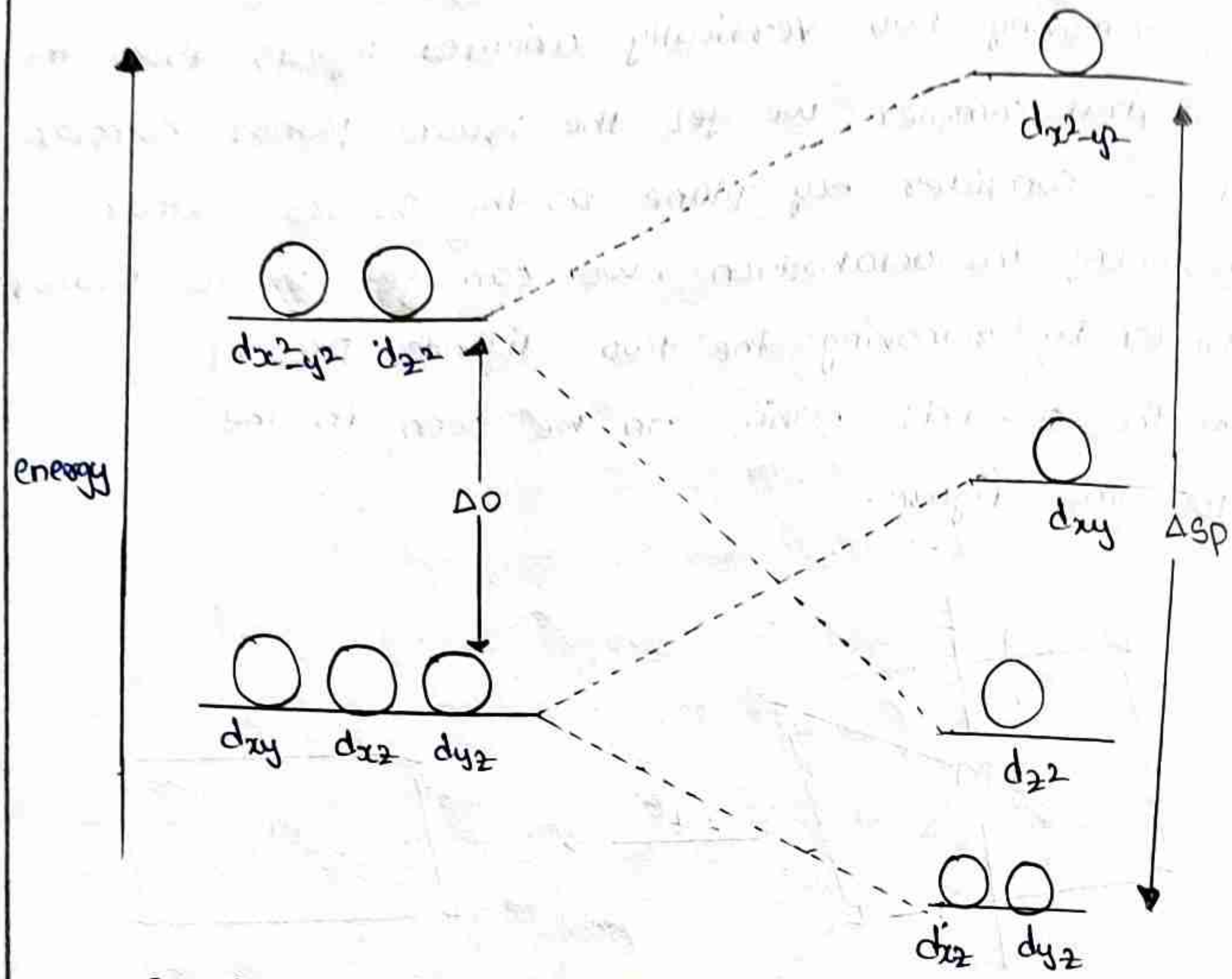
By removing two vertically oriented ligands from the octahydral complex we get the square planar complex. if we consider xy plane as the square planar geometry in octahedron, we can get square planar complex by removing the two ligands present on the z-axis. This can be seen in the following figure.



octahedral geometry Square planar geometry

By removing away the two ligands present on z-axis the d_{z^2} orbital oriented along z-axis is completely free from the repuition by the ligand orbitals. In a similar way d_{xz}, d_{yz} orbitals having "z" axis orientation reduce their repuition by the ligand orbitals to some extent. The energy of these "d" orbitals is reduced differently.

* The splitting of d-orbitals in square planar geometry in shown in the figure below.



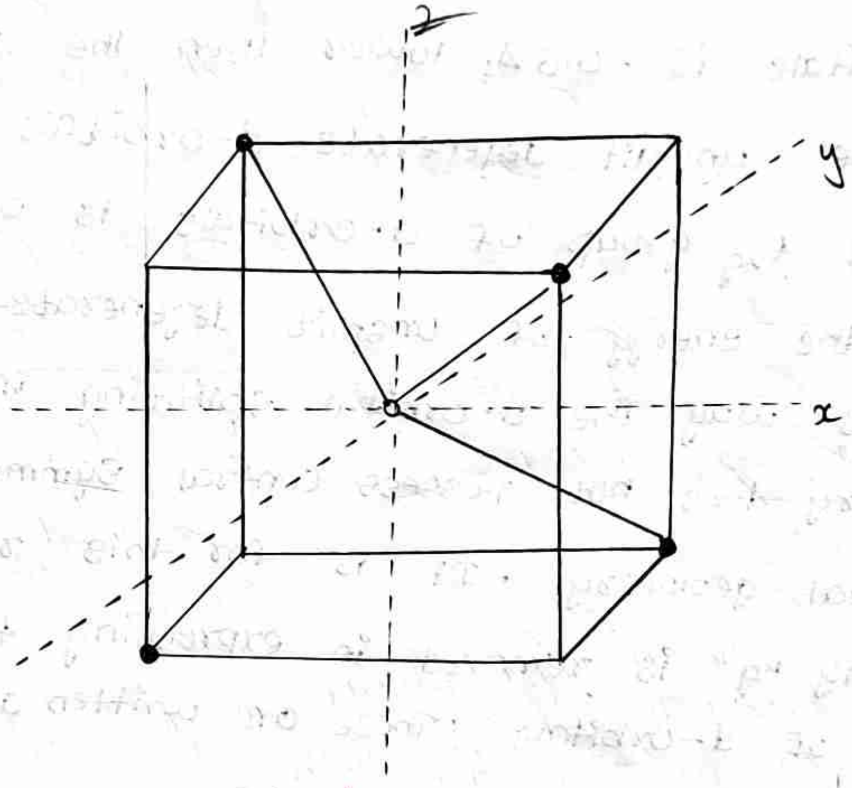
Crystal field splitting in square planar geometry.

The Crystal field Splitting energy (Δ_{SP}) is more then Δ_o These two are related by the equation

$\Delta_{SP} = 1.3\,\Delta_o$

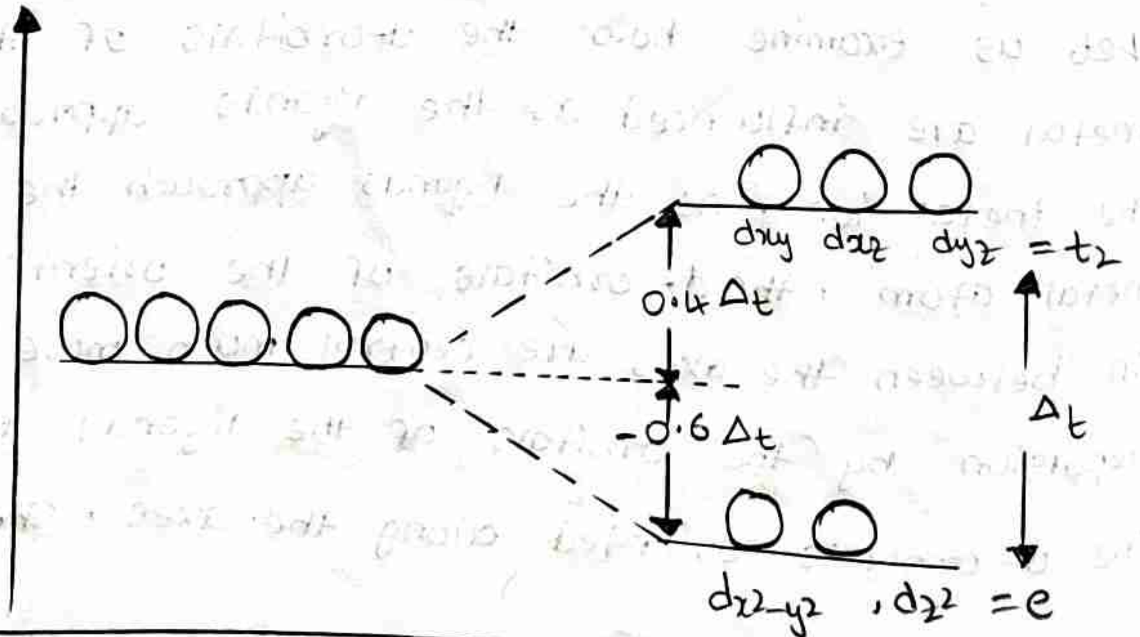
* d-orbital splitting in tetrahedral complexes:

even though it is little difficult to imagine the splitting of d-orbitals in tetrahedral geometry it is easy to understand the splitting pattern if the tetrahedral geometry is assumed to be in a cube as shown in the figure. The four corners of a tetrahedron occupy four corners out of 8 corners of a cube as shown in the figure. The x, y, z axes go through the centres of the opposite faces as shown in the figure.



Tetrahedron fixed in a cube.

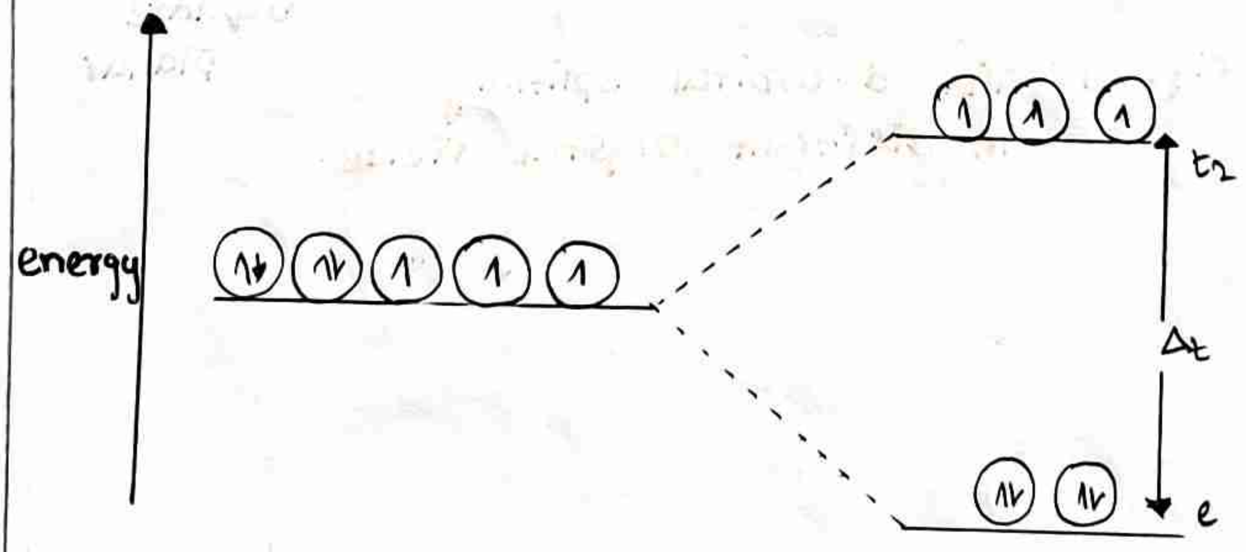
Let us examine how the d-orbitals of the metal are influenced as the ligands approach the metal ion. As the ligands approach the central metal atom, the d-orbitals of the oriented in between the axes are central much more under repulsion by the orbitals of the ligands then the d-orbitals oriented along the axes. Therefore the energy of t_{2g} orbitals increases. The energy of e_g orbitals decreases. In this way the 5 degenerate "d" orbitals are split into two groups of d-orbitals. The eenergy difference between these two groups of d-orbitals is denoted by Δ_t (t = tetrahedral). The energy of e_g group of d-orbitals is $-0.6\,\Delta_t$ lower then the energy of the unsplit degenerate d-orbitals. The energy of the t_{2g} group of d-orbitals is $0.4\,\Delta_t$ higher then the energy of unsplit degenerate "d" orbitals. In this way the d-orbital splitting in tetrahedral geometry does not possess central symmetry as octahedral geometry. It is for this reason generally "g" is removed in expressing the two groups of d-orbitals. These are written as e, t_2 instead e_g, t_{2g}.



There will be no direct interaction between the d-orbitals of the metal with the orbitals of the ligand as shown earlier unlike in octahydral geometry, only 4 ligands are present in the tetrahedral complexes in the coordination sphere. The crystal field splitting energy of the tetrahedral geometry is, therefore, less then the of the octahedral geometry This tetrahedral splitting Δ_t is found experimentally to be 4/9 of the octahedral Δ_0

$$\Delta_t = 4/9\ \Delta_0$$

* Some examples of tetrahedral complexes are $[CoCl_4]^{2-}$ $[NiCl_4]^{2-}$, $[Zn(NH_3)_4]^{2+}$ etc. The electron distribution in the different d-orbitals in this type of complexes is illustrated by taking $[CoCl_4]^{2+}$ as example.



This complex contains three single electrons. Hence it exhibits paramagnetism.

* The d-orbital splitting in the three types of geometries is comprehended below in the figure.

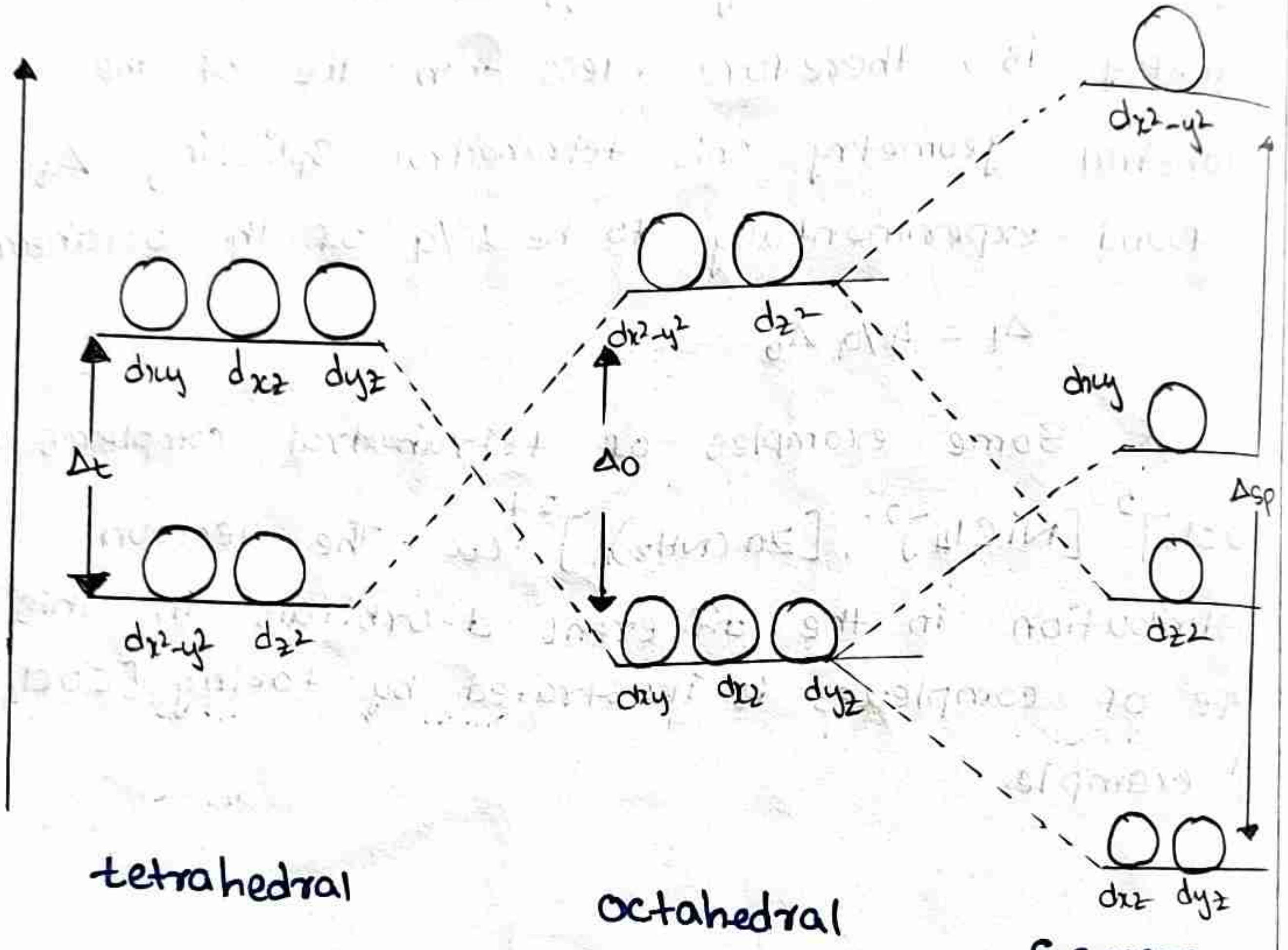


fig. 1.7: The d-orbital splitting in different crystal fields.

* Crystal field stabilization energy (CFSE) :-

under the influence of crystal field, the d-orbitals of the metal get split There fore the electrons enter selectivity in d-orbitals of flower energy. The energy of the complex formed in this way is lowered. the complex attains stability. The stabilization energy thus attained by the complex is called "Crystal field stabilization energy".

-: The electronic arrangemet, CFSE values of octahedral complexes :-

No. of d-orbitals	electron arrangement in pressence of weak field ligand		CFSE	electron arrange-ment in Presence of strong ligand		CFSE
	t_{2g}	e_g		t_{2g}	e_g	
1	(↑)( )( )	( )( )	$-0.4\Delta_o$	(↑)( )( )	( )( )	$-0.4\Delta_o$
2	(↑)(↑)( )	( )( )	$-0.8\Delta_o$	(↑)(↑)( )	( )( )	$-0.8\Delta_o$
3	(↑)(↑)(↑)	( )( )	$-1.2\Delta_o$	(↑)(↑)(↑)	( )( )	$-1.2\Delta_o$
4	(↑)(↑)(↑)	(↑)( )	$-0.6\Delta_o$	(↑↓)(↑)(↑)	( )( )	$-1.6\Delta_o$
5	(↑)(↑)(↑)	(↑)(↑)	$0\Delta_o$	(↑↓)(↑↓)(↑)	( )( )	$-2.0\Delta_o$
6	(↑↓)(↑)(↑)	(↑)(↑)	$-0.4\Delta_o$	(↑↓)(↑↓)(↑↓)	( )( )	$-2.4\Delta_o$
7	(↑↓)(↑↓)(↑)	(↑)(↑)	$-0.8\Delta_o$	(↑↓)(↑↓)(↑↓)	(↑)( )	$-1.8\Delta_o$
8	(↑↓)(↑↓)(↑↓)	(↑)(↑)	$-1.2\Delta_o$	(↑↓)(↑↓)(↑↓)	(↑)(↑)	$-1.2\Delta_o$
9	(↑↓)(↑↓)(↑↓)	(↑↓)(↑)	$-0.6\Delta_o$	(↑↓)(↑↓)(↑↓)	(↑↓)(↑)	$-0.6\Delta_o$
10	(↑↓)(↑↓)(↑↓)	(↑↓)(↑↓)	$0\Delta_o$	(↑↓)(↑↓)(↑↓)	(↑↓)(↑↓)	$0\Delta_o$

-: The electronic arrangment , CFSE values of tetrahedral complexes :-

No. of d-orbital electrons	electron arrangement in pressence of weak field ligand		CFSE	electron arrangemen-t in presence of strong ligand		CFSE
	e	t_2		e	t_2	
1	(↑) ( ) ( )	( ) ( )	$-0.6\Delta_t$	(↑) ( ) ( )	( ) ( )	$-0.6\Delta_t$
2	(↑) (↑) ( )	( ) ( )	$-1.2\Delta_t$	(↑) (↑) ( )	( ) ( )	$-1.2\Delta_t$
3	(↑↓) (↑) ( )	( ) ( )	$-1.8\Delta_t$	(↑↓) (↑) ( )	( ) ( )	$-1.8\Delta_t$
4	(↑↓) (↑↓) ( )	( ) ( )	$-2.4\Delta_t$	(↑↓) (↑↓) ( )	( ) ( )	$-2.4\Delta_t$
5	(↑↓) (↑↓) (↑)	( ) ( )	$-2.0\Delta_t$	(↑↓) (↑↓) (↑)	( ) ( )	$-2.0\Delta_t$
6	(↑↓) (↑↓) (↑)	(↑) ( )	$-1.6\Delta_t$	(↑↓) (↑↓) (↑)	(↑) ( )	$-1.6\Delta_t$
7	(↑↓) (↑↓) (↑)	(↑) (↑)	$-1.2\Delta_t$	(↑↓) (↑↓) (↑)	(↑) (↑)	$-1.2\Delta_t$
8	(↑↓) (↑↓) (↑↓)	(↑) (↑)	$-0.8\Delta_t$	(↑↓) (↑↓) (↑↓)	(↑) (↑)	$-0.8\Delta_t$
9	(↑↓) (↑↓) (↑↓)	(↑↓) (↑)	$-0.4\Delta_t$	(↑↓) (↑↓) (↑↓)	(↑↓) (↑)	$-0.4\Delta_t$
10	(↑↓) (↑↓) (↑↓)	(↑↓) (↑↓)	$0\Delta_t$	(↑↓) (↑↓) (↑↓)	(↑↓) (↑↓)	$0\Delta_t$

The merits and demerits of crystal field theory

-: Merits :-

* The crystal field theory (CFT) is more quantitative in approach compared to the valence Bond Theory (VBT)
* It considered both the metal ion and the ligands as Point charges and hence quantitative calculation of stabilization energy of complexes by electrostatic methods is made easier.
* further CFT was able to calculate the stabilization energies of metal complexes quantitatively.
* The theory could well the spectral and the magnetic behavier of metal complexes

-: Demerits :-

* The CFT considered the metal ligand bond Purely as an ionic bond. This is not true in all complexes.
* CFT Predicts that octahedral complexes are more stable then tetrahedral complexes. But there are many tetra hedral complexes which are more stable. This is due to other reasons. These reasons are not considered by CFT.

Conclusion :-

it describes the breaking of orbital degeneracy in transition metal complexes due to the presence of ligands. Crystal field theory, which asumes that metal ligand interactions are only electrostatic in nature and explains many importent properties of transition metal complexes in an octahedral complex. the d orbitals of the central metal ion divide into two sets of different energies. The separation in energy is the crystal field splitting energy, Δ.

The Interaction between these ligands with the central metal atom (or) ion is subject to crystal field theory

Crystal field theory is often termed "ligand field theory"

Goverment Degree college For Women's

Chemistry Project Work

Topic:- Amino Acids

Supervisor:- Jyothi Madam

Done by:-

Name:- 1. Ayesha Athar 4. K. Ramya
2. sushma 5. R. Deepika
3. Zuha. 6. V. Poojitha
7. Rugsar Begum

Group:- Bsc (Mbzc).

HTNO. 20077164457003.

* INTRODUCTION *

What is an Amino acid.

An Amino acid is an organic molecule that is made up of a basic amino group (-NH₂), an acidic carboxyl group (-COOH), and an organic R group (or side chain) that is unique to each amino acid.

The term amino acid is short for α-amino [alpha-amino] carboxylic acid.

Each molecule contains a central carbon (c) atom, called the α-carbon, to which both an amino and a carboxyl group are attached. The remaining two bonds of the α-carbon atom are generally statisfied by a hydrogen (H) atom and the group.

* Important points of amino acids *

* Amino acids are the building blocks of the proteins

* About 500 amino acids are known

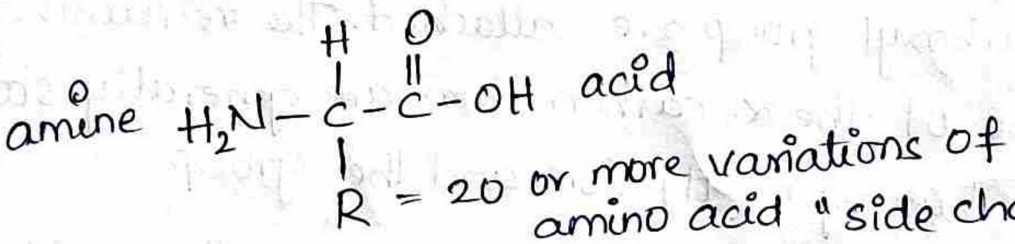
* proteins are linear polymers built of monomer units called amino acid.

* proteins are the most abundant macro-molecules in human body.

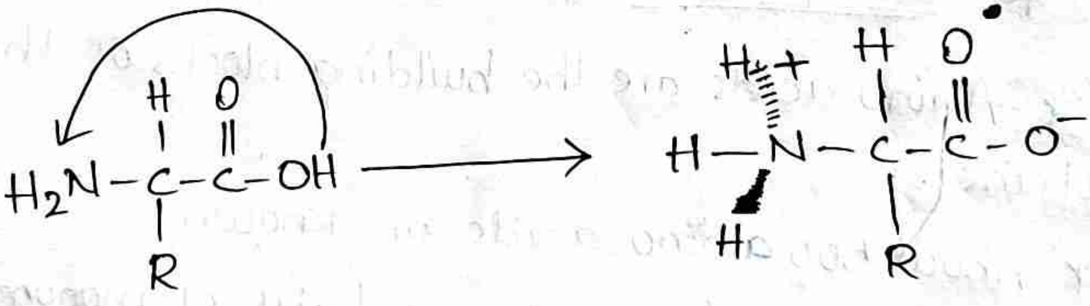
* The function of proteins is directly dependent on the three dimensional structure.

* proteins contain a wide range of functional groups includes, alcohols, thiols, thioethers, carboxylic acid and carboxamide, variety of other basic groups.

* Amino Acid structure *



$H_2N-CH(R)-C(=O)-OH$

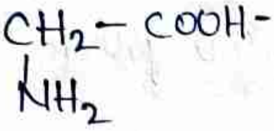


Zwitterion

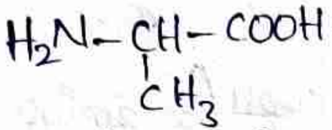
* Amino Acids *

Organic compounds containing one (or) more amino groups and one (or) more carbonyl groups in the same molecule are known as amino acids.

Ex:-



$\underset{NH_2}{CH_2}-COOH$ - Glycine (α-amino acetic acid)



$H_2N-\underset{CH_3}{CH}-COOH$ -Alanine (α-amino propionic acid)

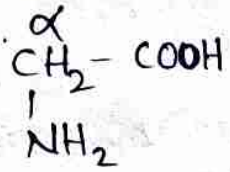
classification of Amino acids

I) Based on the position of $-NH_2$ group from $-COOH$ group amino acids are classified as follows.

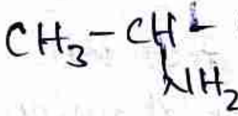
a) α-Amino acids :-

These amino acids position of amino group is present on α-carbon atom.

Ex:-



$\underset{NH_2}{\overset{\alpha}{CH_2}}-COOH$ (Glycine)

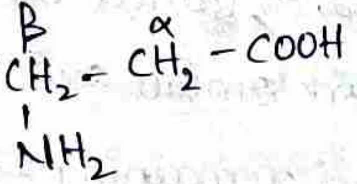


$CH_3-\underset{NH_2}{CH}-COOH$ (Alanine)

b) β-Amino acids

These amino acids position of amino group is present on β-carbon atom.

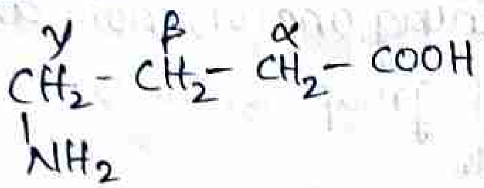
Ex:-



$\underset{NH_2}{\overset{\beta}{CH_2}}-\overset{\alpha}{CH_2}-COOH$ (β-amino propionic acid)

c) **γ- Amino acids**

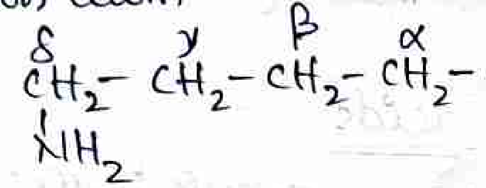
These amino acids position of amino group is on γ- carbon atom.

ex:- 

$\underset{\underset{NH_2}{|}}{\overset{\gamma}{C}}H_2 - \overset{\beta}{C}H_2 - \overset{\alpha}{C}H_2 - COOH$ (γ- amino buteric acid)

d) **δ- Amino acids**

These amino acids position of amino group is present on δ- carbon atom.

ex:- 

$\underset{\underset{NH_2}{|}}{\overset{\delta}{C}}H_2 - \overset{\gamma}{C}H_2 - \overset{\beta}{C}H_2 - \overset{\alpha}{C}H_2 - COOH$ (δ- amino pentanoic acid)

II) **Based on the source**

a) **Natural amino acid**

The amino acids are obtained by the hydrolysis of protein are natural amino acids. All natural amino acids are α- amino acids.

b) **Synthetic amino acids:-**

The amino acids which are not available naturally and are prepared by chemical methods are called synthetic amino acids.

classification of Natural amino acids

Nearly 25- amino acids are obtained by hydrolysis of proteins. out of these, two are amino acids (proline and hydroxy-proline) and remaining 23 are amino acids.

a) Essential amino acids:-

The amino acids, which are not synthesised in the body, hence has to be supplied through food for normal growth are called essential amino acids.

There are 10 essential amino acids.

1) Methionine 2) Arginine 3) Threonine 4) Tryptophan
5) Valine 6) Isoleucine 7) Leucine 8) phenyl alanine
9) Histidine 10) Lysin.

b) Non-essential amino acids

The amino acids which are synthesised in the body are called non-essential amino acids.

Ex:- Remaining 15.

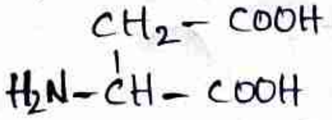
1) Glycine 2) Alanine 3) Cystine 4) Thyroxine etc.

classification of amino acids into acidic, basic Neutral amino acids

The amino Depending upon the chemical nature, amino acids classified into 3 types.

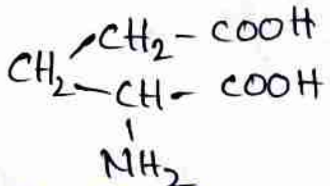
a) Acidic Amino acids :- In these amino acids, the number of $-COOH$ groups are more than the number of $-NH_2$ groups.

Ex:-



$$\begin{array}{l} \quad\quad\quad CH_2-COOH \\ \quad\quad\quad\ \ | \\ H_2N-CH-COOH \end{array}$$

Aspartic acid

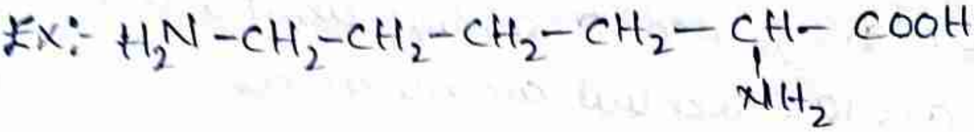


$$\begin{array}{l} \quad\quad CH_2-COOH \\ CH_2-CH-COOH \\ \quad\quad\ \ | \\ \quad\quad NH_2 \end{array}$$

Glutamic acid

b) Basic amino acids

In these amino acids, the number of $-NH_2$ groups are more than the number of $-COOH$ groups.

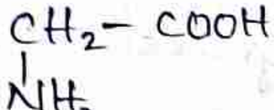
Ex:- 

$H_2N-CH_2-CH_2-CH_2-CH_2-\underset{NH_2}{\underset{|}{CH}}-COOH$ Lysine

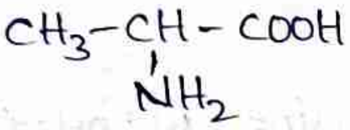
c) Neutral amino acids:-

In these amino acids, the number of $-NH_2$ groups and $-COOH$ groups are same.

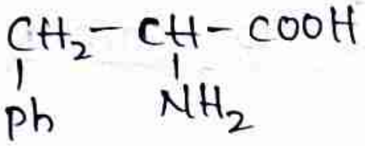
Ex:-



$\underset{NH_2}{\underset{|}{CH_2}}-COOH$ - Glycine



$CH_3-\underset{NH_2}{\underset{|}{CH}}-COOH$ - Alanine

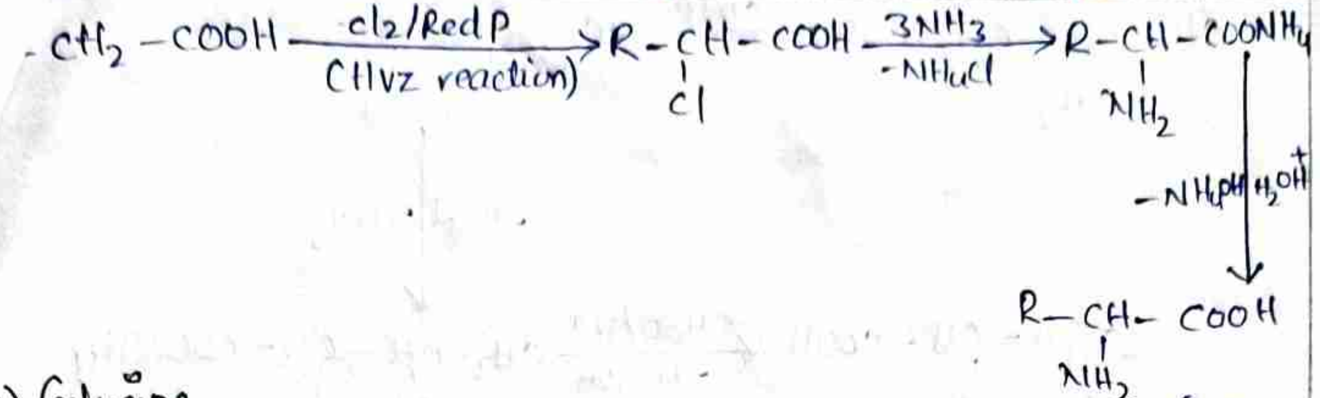


$\underset{Ph}{\underset{|}{CH_2}}-\underset{NH_2}{\underset{|}{CH}}-COOH$ - phenyl alanine

Methods of synthesis

(I)-From halogenated carboxylic acids

carboxylic acids on treating with Cl_2 (or) Br_2 inpresence of red P (HVZ reaction) forms α-halo acids, which on treating with NH_3 forms α-amino acids.

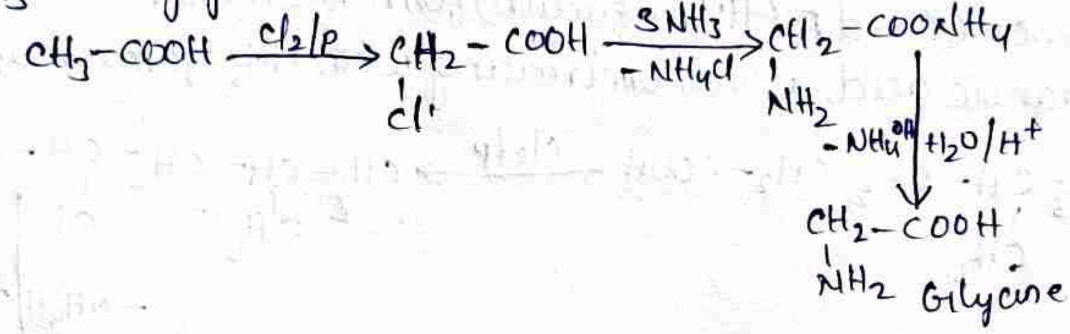


$$\text{-}CH_2-COOH \xrightarrow[\text{(HVZ reaction)}]{Cl_2/Red\ P} R-\underset{\underset{Cl}{|}}{CH}-COOH \xrightarrow[-NH_4Cl]{3NH_3} R-\underset{\underset{NH_2}{|}}{CH}-COONH_4 \xrightarrow[H_2O/H^+]{-NH_4OH} R-\underset{\underset{NH_2}{|}}{CH}-COOH$$

α-amino acid.

a) <u>Glycine</u>

Acetic acid on treating with Cl_2 (or) Br_2 in presence of red P (HVZ reaction) form α-chloro acetic acid, which on treating with NH_3 form glycine.

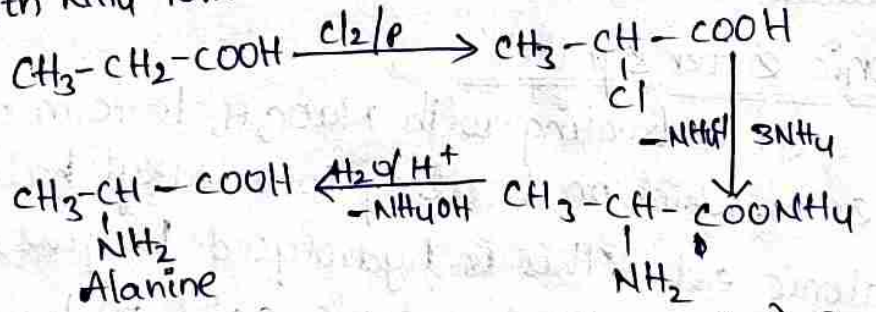


$$CH_3-COOH \xrightarrow{Cl_2/P} \underset{\underset{Cl}{|}}{CH_2}-COOH \xrightarrow[-NH_4Cl]{3NH_3} \underset{\underset{NH_2}{|}}{CH_2}-COONH_4 \xrightarrow[-NH_4OH]{H_2O/H^+} \underset{\underset{NH_2}{|}}{CH_2}-COOH$$

Glycine

b) <u>Alanine</u>

propionic acid on treating with Cl_2 (or) Br_2 in presence of red P (HVZ reaction) from α-chloro propionic acid; which on treating with NH_4 form alanine.

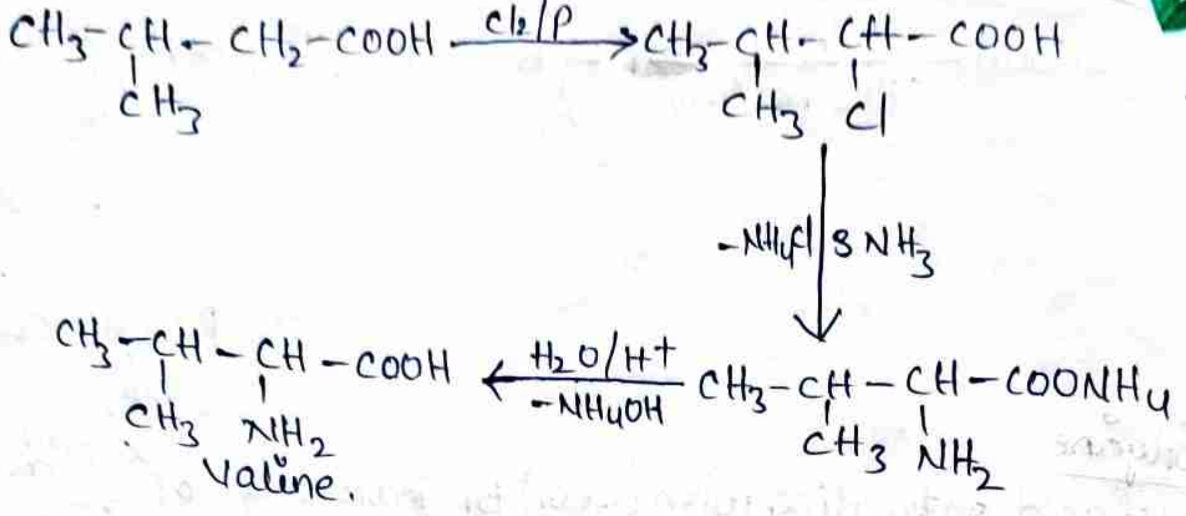


$$CH_3-CH_2-COOH \xrightarrow{Cl_2/P} CH_3-\underset{\underset{Cl}{|}}{CH}-COOH \xrightarrow[-NH_4Cl]{3NH_4} CH_3-\underset{\underset{NH_2}{|}}{CH}-COONH_4 \xrightarrow[-NH_4OH]{H_2O/H^+} CH_3-\underset{\underset{NH_2}{|}}{CH}-COOH$$

Alanine

c) <u>valine</u>

3-methyl butanoic acid on treating with Cl_2 (or) Br_2 in presence of red P (HVZ reaction) form α-chloro 3-methyl butanoic which on treating with NH_3 form valine.

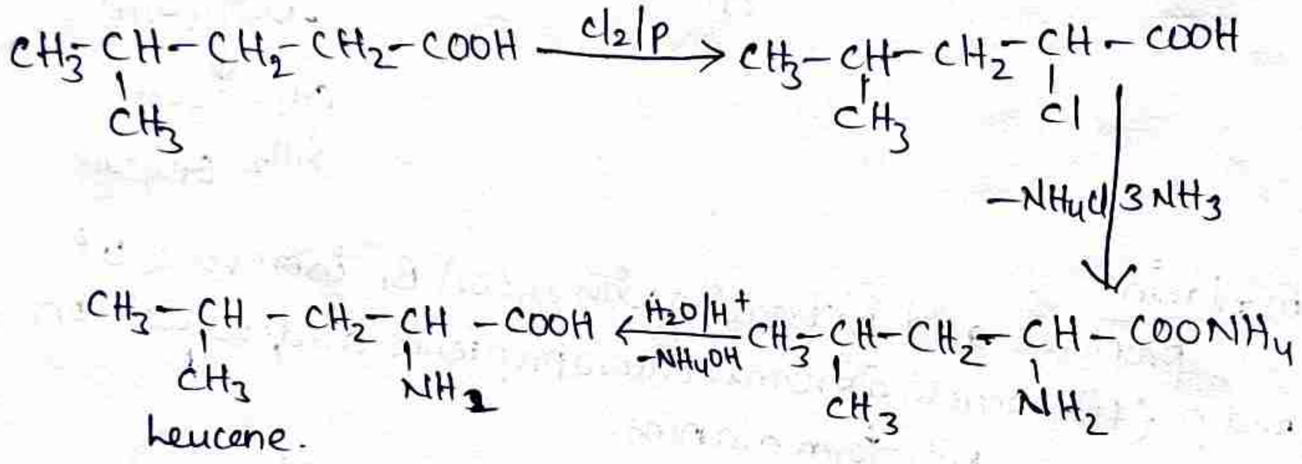


$$CH_3-\underset{CH_3}{CH}-CH_2-COOH \xrightarrow{Cl_2/P} CH_3-\underset{CH_3}{CH}-\underset{Cl}{CH}-COOH \xrightarrow[-NH_4Cl]{3NH_3} CH_3-\underset{CH_3}{CH}-\underset{NH_2}{CH}-COONH_4$$

$$\underset{\text{Valine.}}{CH_3-\underset{CH_3}{CH}-\underset{NH_2}{CH}-COOH} \xleftarrow[-NH_4OH]{H_2O/H^+} CH_3-\underset{CH_3}{CH}-\underset{NH_2}{CH}-COONH_4$$

d) Leucene

4-methyl pentanoic acid on treating with Cl_2 (or) Br_2 in presence of red P (HVZ reaction) form α-chloro 4-methyl pentanoic acid, which on treating with NH_3 form leucene.

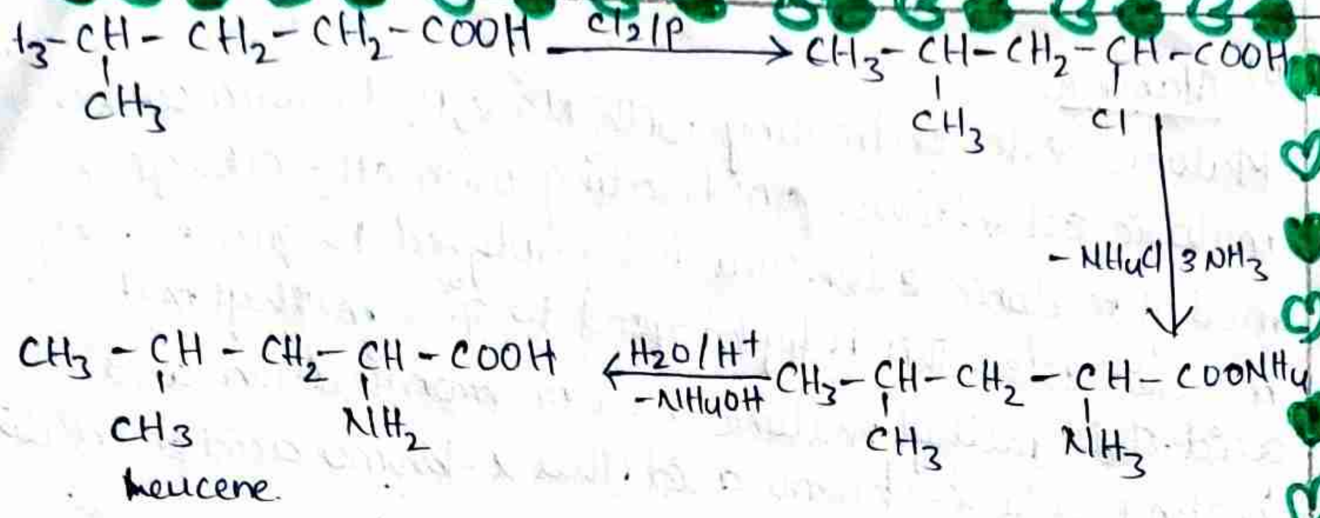


$$CH_3-\underset{CH_3}{CH}-CH_2-CH_2-COOH \xrightarrow{Cl_2/P} CH_3-\underset{CH_3}{CH}-CH_2-\underset{Cl}{CH}-COOH \xrightarrow[-NH_4Cl]{3NH_3} CH_3-\underset{CH_3}{CH}-CH_2-\underset{NH_2}{CH}-COONH_4$$

$$\underset{\text{Leucene.}}{CH_3-\underset{CH_3}{CH}-CH_2-\underset{NH_2}{CH}-COOH} \xleftarrow[-NH_4OH]{H_2O/H^+} CH_3-\underset{CH_3}{CH}-CH_2-\underset{NH_2}{CH}-COONH_4$$

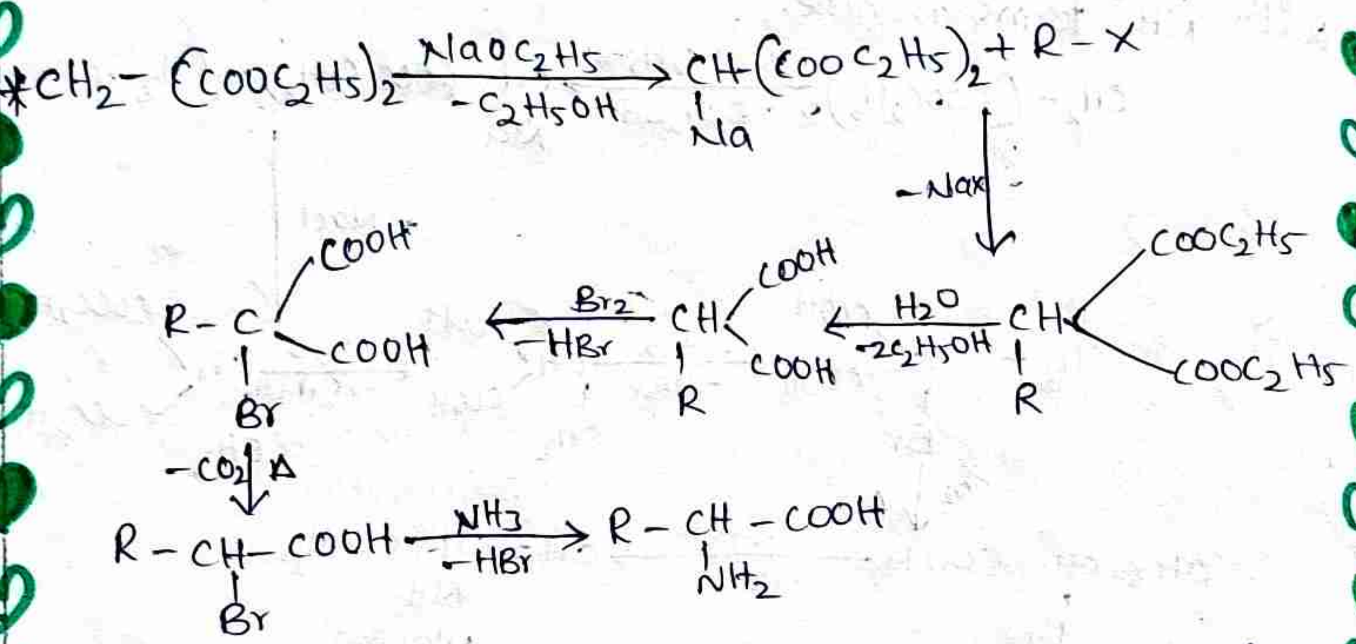
II) Malonic ester synthesis

Malonic ester on treating with $NaOC_2H_5$ to form sodio malonic ester. which on treating with alkyl halide to give alkyl malonic ester. This is hydrolysed to give alkyl malonic acid. This alkyl malonic acid on halogenation and heating give α-halo acid. This α-halo acid on treating with NH_3 forms α-amino acid.



$$H_3-\underset{CH_3}{CH}-CH_2-CH_2-COOH \xrightarrow{Cl_2/P} CH_3-\underset{CH_3}{CH}-CH_2-\underset{Cl}{CH}-COOH \xrightarrow[-NH_4Cl]{3NH_3} CH_3-\underset{CH_3}{CH}-CH_2-\underset{NH_3}{CH}-COONH_4 \xrightarrow[-NH_4OH]{H_2O/H^+} CH_3-\underset{CH_3}{CH}-CH_2-\underset{NH_2}{CH}-COOH$$

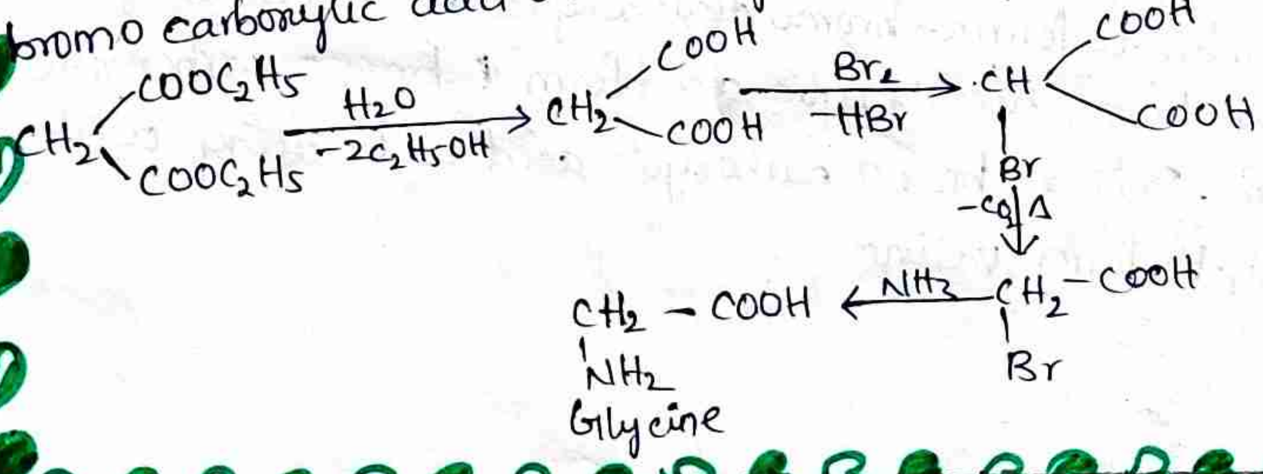
Leucene



$$*CH_2-(COOC_2H_5)_2 \xrightarrow[-C_2H_5OH]{NaOC_2H_5} \underset{Na}{CH}(COOC_2H_5)_2 + R-X \xrightarrow{-NaX} \underset{R}{CH}(COOC_2H_5)_2 \xrightarrow[-2C_2H_5OH]{H_2O} \underset{R}{CH}(COOH)_2 \xrightarrow[-HBr]{Br_2} R-\underset{Br}{C}(COOH)_2 \xrightarrow{-CO_2/\Delta} R-\underset{Br}{CH}-COOH \xrightarrow[-HBr]{NH_3} R-\underset{NH_2}{CH}-COOH$$

a) Glycine

Malonic ester on treating with water to form malonic acid. which on treating with Br_2 to form α- bromo dicarboxylic acid. Decarboxylation of α- bromo dicarboxylic acid to form α- bromo carboxylic acid. This α- bromo carboxylic acid on treating with NH_3 forms Glycine.

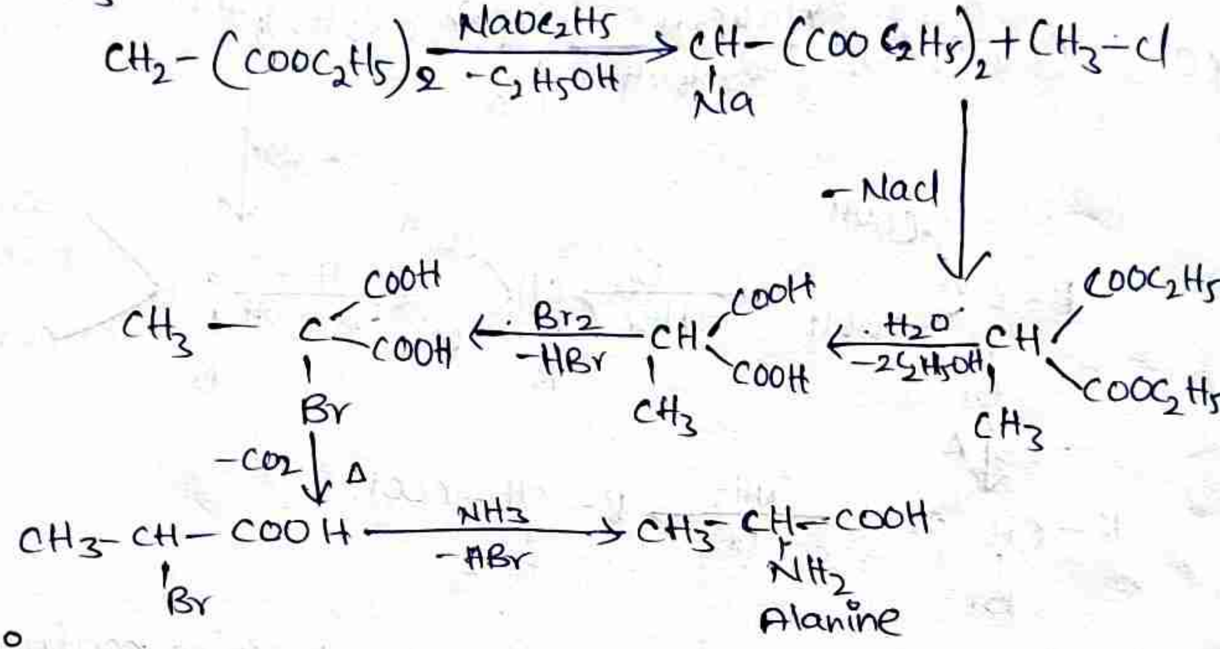


$$CH_2(COOC_2H_5)_2 \xrightarrow[-2C_2H_5OH]{H_2O} CH_2(COOH)_2 \xrightarrow[-HBr]{Br_2} \underset{Br}{CH}(COOH)_2 \xrightarrow{-CO_2/\Delta} \underset{Br}{CH_2}-COOH \xrightarrow{NH_3} \underset{NH_2}{CH_2}-COOH$$

Glycine

b) Alanine

Malonic ester on treating with $NaOC_2H_5$ to form sodio malonic ester. which on treating with CH_3-Cl to give methyl malonic ester. This is hydrolysed to give methyl malonic ester. This is hydrolysed to give methyl malonic acid. This methyl malonic acid on bromination and heating give α- bromo acid (This α-bromo acid on treating with NH_3 forms alanine.



$$CH_2-(COOC_2H_5)_2 \xrightarrow[-C_2H_5OH]{NaOC_2H_5} \underset{Na}{CH}-(COOC_2H_5)_2 + CH_3-Cl$$

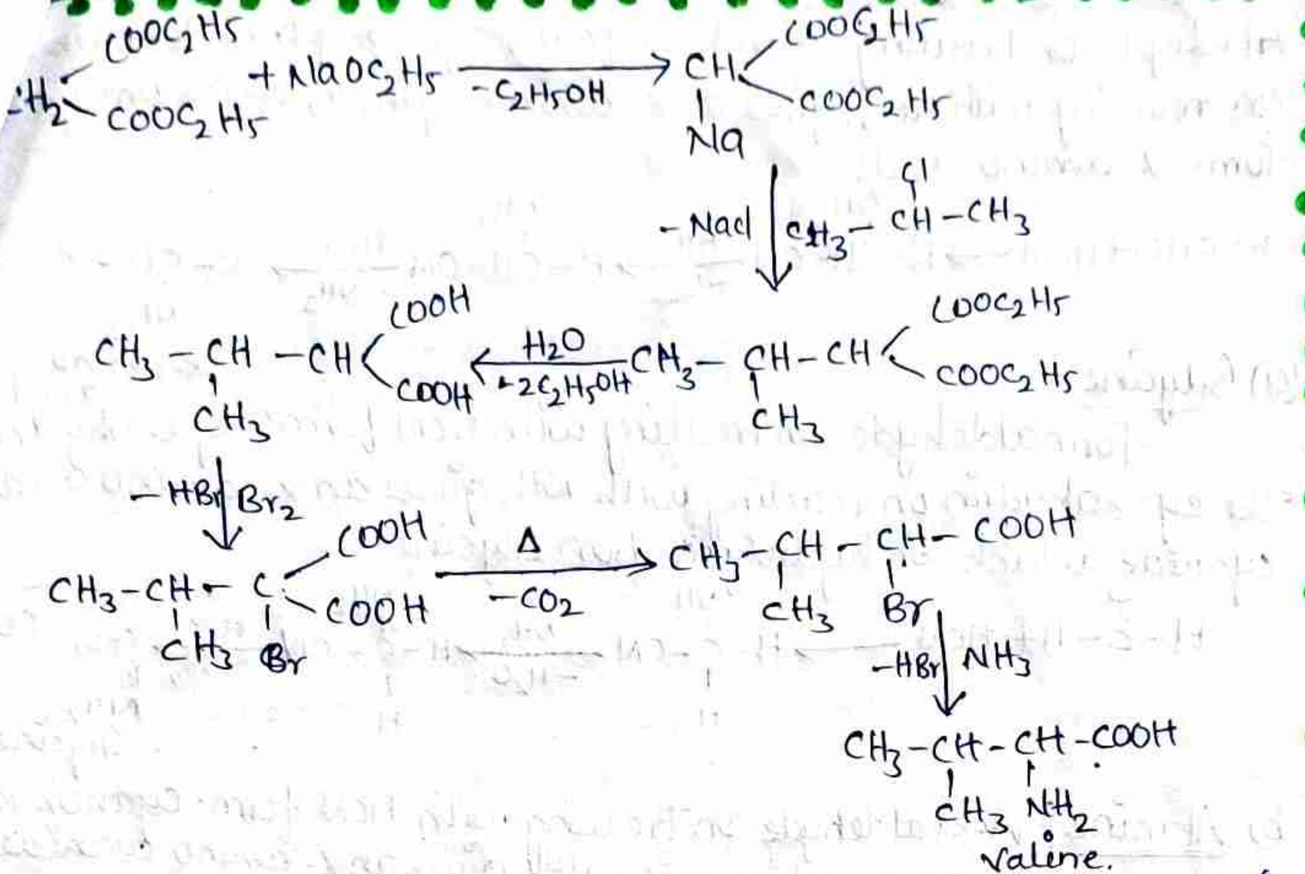
$$\xrightarrow{-NaCl} \underset{CH_3}{CH}(COOC_2H_5)_2 \xrightarrow[-2C_2H_5OH]{H_2O} \underset{CH_3}{CH}(COOH)_2 \xrightarrow[-HBr]{Br_2} CH_3-\underset{Br}{C}(COOH)_2$$

$$\xrightarrow[\Delta]{-CO_2} CH_3-\underset{Br}{CH}-COOH \xrightarrow[-HBr]{NH_3} CH_3-\underset{NH_2}{CH}-COOH$$

Alanine

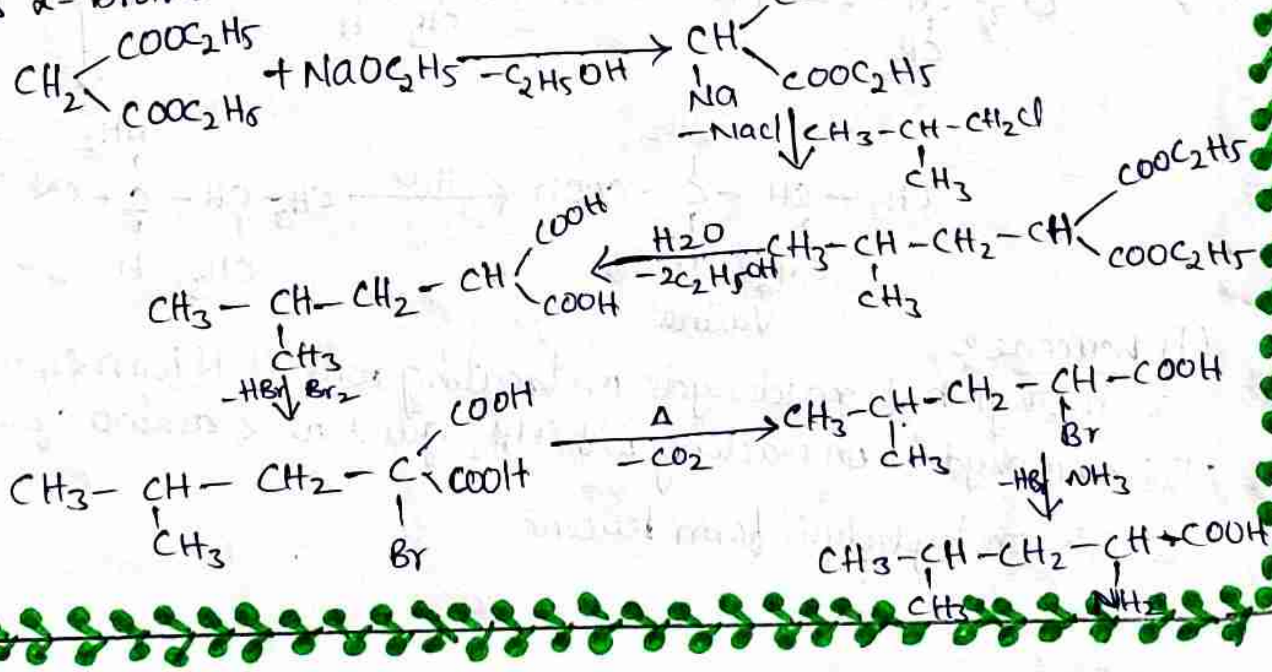
(c) valine :-

Malonic ester on treating with $NaOC_2H_5$ to form sodio malonic ester. which on treating with 2-chluro propane to give substituted propyl malonic ester. This is hydrolysed to give dicarboxylic acid. this is reactd with bromine to form α-bromo dicarboxylic acid. Decarboxylation of α- bromo dicarboxylic acid form α-bromo carboxylic acid. This α- bromo carboxylic acid on treating with NH_3 to form valine



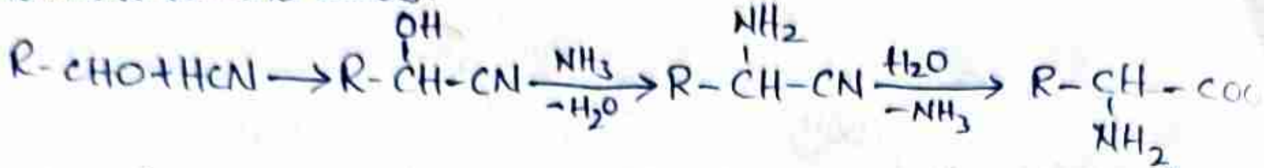
d) Leucene :

Malonic ester on treating with $NaOC_2H_5$ to form sodio malonic ester. which on treating with α-chloro,2-methyl propane to give substituted 2-methyl propyl malonic ester. Hydrolysis of 2-methyl propyl malonic ester to form dicarboxylic acid. this is react with Br_2 to form α-bromo dicarboxylic acid. Decarboxylation of α-bromodicarboxylic acid to form α-bromo carboxylic acid. This α-bromo carboxylic acid on treating with NH_3 to form leucene



III) strecker's synthesis

Aldehyde on treating with HCN forms cyanohydrin. The on reacting with NH_3, gives an α- amino cyanide, which on forms α- amino acids.

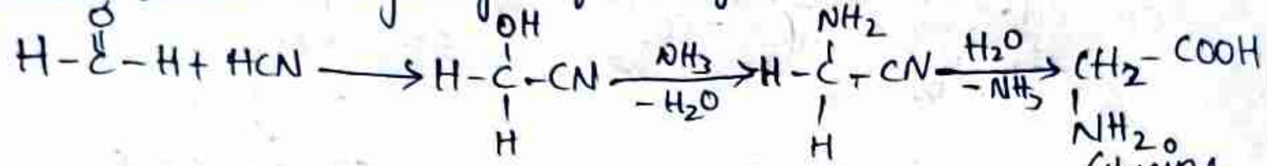


$$R-CHO+HCN \longrightarrow R-\overset{OH}{CH}-CN \xrightarrow[-H_2O]{NH_3} R-\overset{NH_2}{CH}-CN \xrightarrow[-NH_3]{H_2O} R-\underset{NH_2}{CH}-CO$$

α-amino acid

(a) Glycine :

Formaldehyde on treating with HCN forms cyanohydrin, The cyanohydrin on reacting with NH_3 gives an α- amino acid cyanide which on hydrolysis from Glycine.

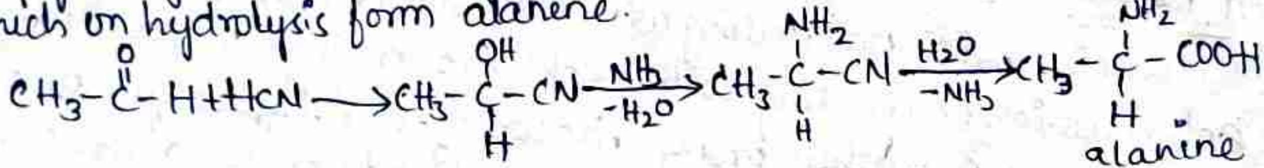


$$H-\overset{O}{\overset{\|}{C}}-H+HCN \longrightarrow H-\underset{H}{\overset{OH}{C}}-CN \xrightarrow[-H_2O]{NH_3} H-\underset{H}{\overset{NH_2}{C}}-CN \xrightarrow[-NH_3]{H_2O} \underset{NH_2}{CH_2}-COOH$$

Glycine

b) Alanine :

Acetaldehyde on treating with HCN form cyanohydrin The cyanohydrin on reacting with NH_3 gives an α- amino cyanide, which on hydrolysis form alanine.

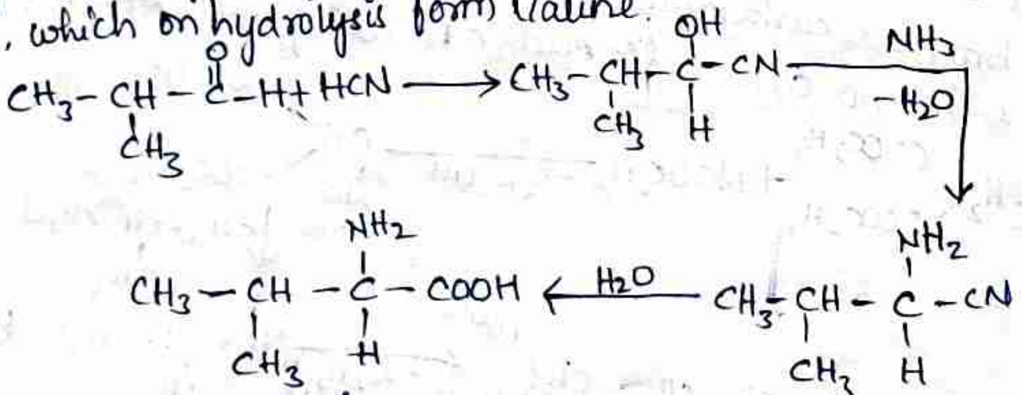


$$CH_3-\overset{O}{\overset{\|}{C}}-H+HCN \longrightarrow CH_3-\underset{H}{\overset{OH}{C}}-CN \xrightarrow[-H_2O]{NH_3} CH_3-\underset{H}{\overset{NH_2}{C}}-CN \xrightarrow[-NH_3]{H_2O} CH_3-\underset{H}{\overset{NH_2}{C}}-COOH$$

alanine

(c) valine :

2-methyl propionaldehyde on treating with HCN form cyanohydrin. The cyanohydrin on reacting with NH_3 gives an α - amino cyanide, which on hydrolysis form valine.



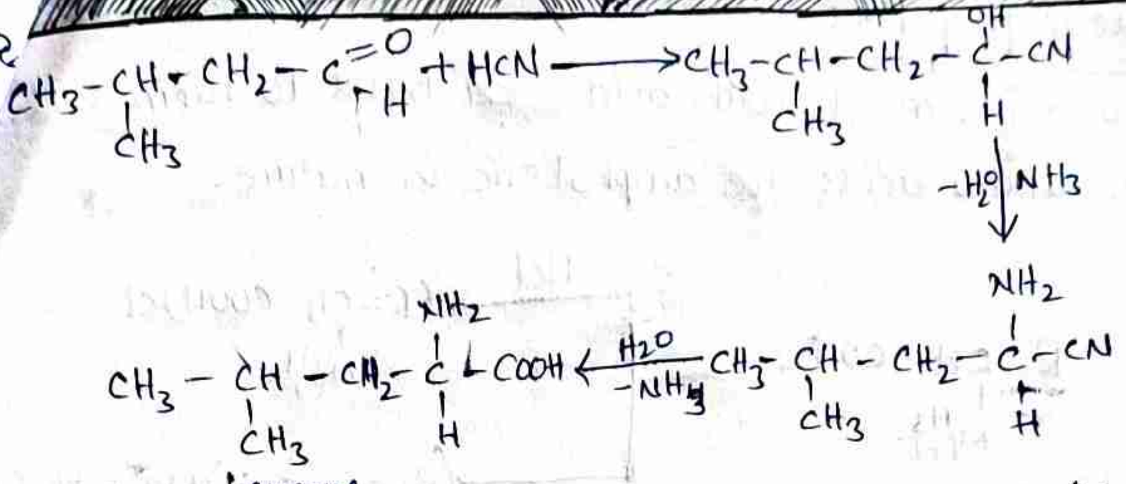
$$CH_3-\underset{CH_3}{CH}-\overset{O}{\overset{\|}{C}}-H+HCN \longrightarrow CH_3-\underset{CH_3}{CH}-\underset{H}{\overset{OH}{C}}-CN \xrightarrow[-H_2O]{NH_3} CH_3-\underset{CH_3}{CH}-\underset{H}{\overset{NH_2}{C}}-CN$$

$$CH_3-\underset{CH_3}{CH}-\underset{H}{\overset{NH_2}{C}}-COOH \xleftarrow{H_2O} CH_3-\underset{CH_3}{CH}-\underset{H}{\overset{NH_2}{C}}-CN$$

Valine

(d) leucene :-

3- methyl buteraldehyde on treating with HCN form cyanohydrin The cyanohydrin on reacting with NH_3 gives an α-amino cyanide which on hydrolysis form leucene



Leucene.

physical properties

Generally amino acids are colourless crystalline solids

(1) Melting points

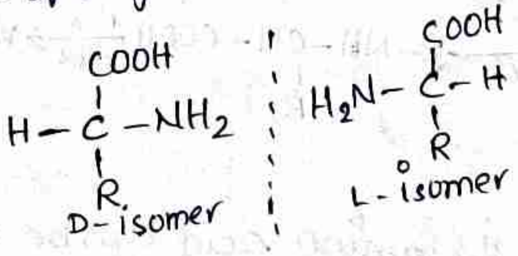
They are having both acidic and basic groups, hence they are regarded as salts. Therefore they are having high melting points

(2) solubility :-

They are soluble in water, acids, alkalies but sparingly soluble in non- polar organic solvents.

(3) optical activity

Except glycine all amino acids. Exhibit optical activity due to the presence of asymmetric carbon atom at the α- position of amino acid.



Important points

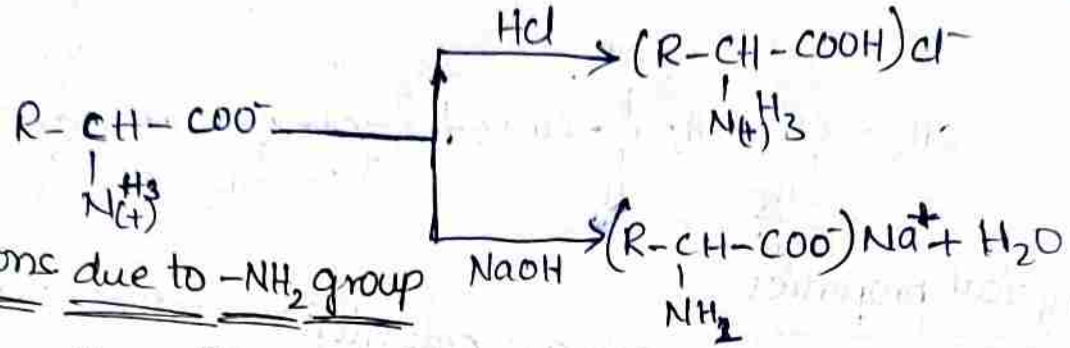
1) All the amino acids don't have same iso electric points and it is rare to have iso electric point is equal to 7.

2) The pH of the iso electric point depends upon the strength of the NH_2 and COOH groups.

3) At iso electric point the solubility of amino acid in water is minimum due to the non- polaric character.

Chemical properties

Amino acids reacts with acids and bases to form sal
Hence, amino acids are amphoteric in nature.



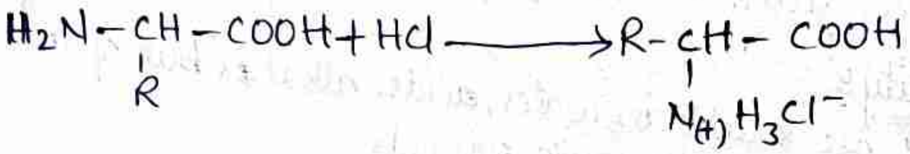
$$R-\underset{\substack{| \\ N_{(+)}H_3}}{CH}-COO^- \xrightarrow{HCl} \left(R-\underset{\substack{| \\ N_{(+)}H_3}}{CH}-COOH\right)Cl^-$$

$$R-\underset{\substack{| \\ N_{(+)}H_3}}{CH}-COO^- \xrightarrow{NaOH} \left(R-\underset{\substack{| \\ NH_2}}{CH}-COO^-\right)Na^+ + H_2O$$

I) Reactions due to $-NH_2$ group

1) Action with mineral acid

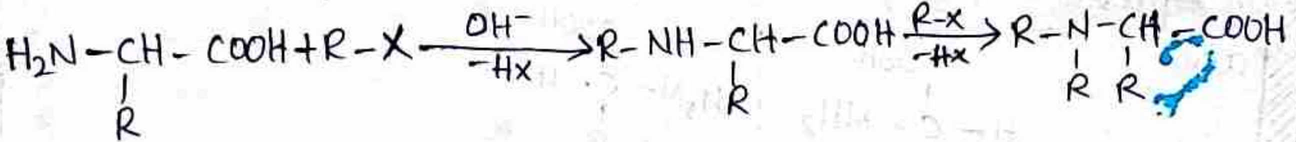
Amino acids form salts on treatment with mineral acids.



$$H_2N-\underset{\substack{| \\ R}}{CH}-COOH + HCl \longrightarrow R-\underset{\substack{| \\ N_{(+)}H_3Cl^-}}{CH}-COOH$$

2) Alkylation

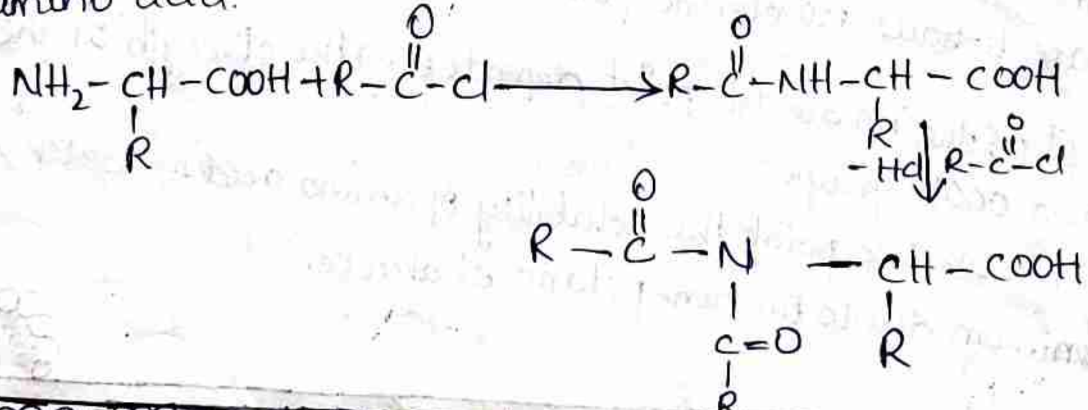
Amino acids in alkaline solution react with alkyl halides to form N-alkyl substituted amino acids.



$$H_2N-\underset{\substack{| \\ R}}{CH}-COOH + R-X \xrightarrow[-HX]{OH^-} R-NH-\underset{\substack{| \\ R}}{CH}-COOH \xrightarrow[-HX]{R-X} R-\underset{\substack{| \\ R}}{N}-\underset{\substack{| \\ R}}{CH}-COOH$$

3) Acylation

The amino group of the amino acid can be acylated with acid halides (or) acid anhydrides to form N-acetyl amino acid.



$$NH_2-\underset{\substack{| \\ R}}{CH}-COOH + R-\overset{\substack{O \\ \|}}{C}-Cl \longrightarrow R-\overset{\substack{O \\ \|}}{C}-NH-\underset{\substack{| \\ R}}{CH}-COOH$$

$$\xrightarrow[-HCl]{R-\overset{\substack{O \\ \|}}{C}-Cl} R-\overset{\substack{O \\ \|}}{C}-\underset{\substack{| \\ C=O \\ | \\ R}}{N}-\underset{\substack{| \\ R}}{CH}-COOH$$

* CONCLUSION *

Taking certain essential amino acids in supplement form may help improve mood, support exercise performance and recovery, and help improve health outcomes after surgery.

All nine essential amino acids perform important roles in your body. They're involved in many processes, including tissue growth, energy production, immune function, and nutrient absorption.

* Benefits of Amino acid *

Amino acids functions throughout your body, including protein synthesis, tissue repair, and nutrient absorption. Some may also help prevent muscle loss, support recovery after surgery, and improve mood, sleep and athletic performance.

Government Degree College for women Karimnagar

Department of chemistry

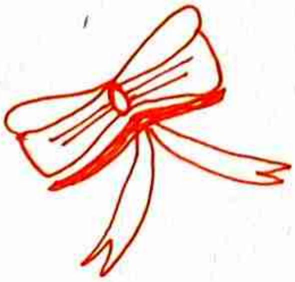
Student study Project

Topic : The chemistry of Garlic

Name of the supervisor : M. Prashanthi madam

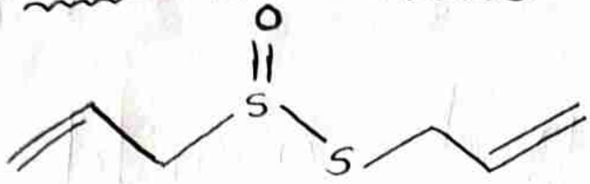
Names of the students : K. Samatha – 5061
K. Sahitya – 5065
M. Trishala – 5078
M. Sushmitha – 5076
K. Archana – 5064

Group – BSc. BZC – V Sem



THE CHEMISTRY OF GARLIC

what causes Garlic Breath?



ALLICIN

Allyl methyl sulfide

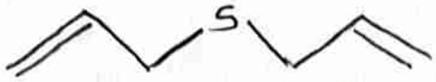
There are four major volatile organic compounds. responsible for 'garlic breath', diallyl disulfide, allyl methyl sulfide, allyl mercaptan, and allyl methyl disulfide. None of these compounds are present in garlic until it is crushed or chopped.

When garlic is mechanically damaged, enzymes convert the compound allicin (which gives chopped garlic its aroma). This is then broken down further into the aforementioned volatile compounds.

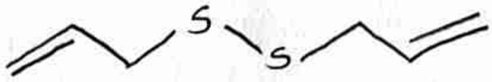
Allyl methyl sulfide is broken down in the body more slowly than the other three compounds. so it is the primary volatile responsible for garlic breath. It can pass into the blood stream & organs, and is excreted via, sweating, breathing and through the urine. its effects can last up to a day!

A few foods have been shown to have some effect on reducing garlic breath, including parsley & milk.

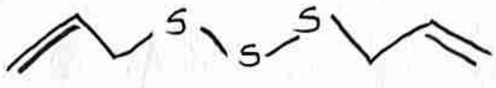
What Gives Garlic Antibacterial Properties?



Diallyl sulfide



Diallyl Disulfide



Diallyl Trisulfide

Sulfur-containing organic compounds give garlic some antibacterial properties. Antimicrobial effects have been shown to increase as the number of sulfur atoms in the compounds increases.

The organosulfer compounds can penetrate the cell membrances of sulfer bacteria cells, and combine with certain enzymes or proteins to alter their structure, injuring the cells.

Allicin, formed initially when garlic is crushed, also has antibacterial properties

Facts About Garlic

* close relatives of Garlic onion, shallot, look, chivo and chioso onion.
* The city of chicago is named after Garlic.
* Along with Adding flavour to food it has immense medicinal properties.
* Garlic derives from middle English, meaning sphere shaped look.
* worldwide it comes in many types including wild Garlic, crow garlic and field Garlic.

Super Health Benefits.

* Lowers cholestrol.
* controls blood pressure.
* Good for Diabetes.
* promotes Gut Health.
* Treats cold
* Antioxidants
* Anti inflammatory
* cancer protective.

Did you know?

5,000 years ago in Ancient Egypt, slaves received a dialy ration of garlic to improve their strength against illnesses.

Amazing Health Benefits of Garlic

* Helps help keep blood pressure under control.
* Numerous therapeutic benefits.
* 12.9%. vitamin B_6
* 15%. manganese
* Numerous beneficial cardiovascular effects
* Ability to lower blood pressure.
* Able to lower our blood triglycerides and total cholesterol.
* 7.4%. vitamin 'c'.
* 5.5%. copper
* 3.2%. calcium
* Anti-inflammatory

* Helps prevent blood vessels from becoming blocked.
* Helps heart attack and antherosclerosis.
* Blood cell and blood vessel protection from inflammatory and oxidative stress.

How Can you Consume Garlic?

* season your favourite foods using raw Garlic
* Take capsules or health supplements that contain allicin.
* consume it raw as a powerful natural medicine.
* Apply it directly to the skin as an antiseptic.

Government Degree college Womens Karimnagar

Department of "chemistry"

Student study project

Topic :- Common fruit Acids.

Name of the Supervisor:-
D.r Prashanthi mam.

Name of the Student:- P. Akanksha
V. Shivani N. Akhila

Group :- B.Sc [BZC] IV Sem

Topic :=

Common

Fruit

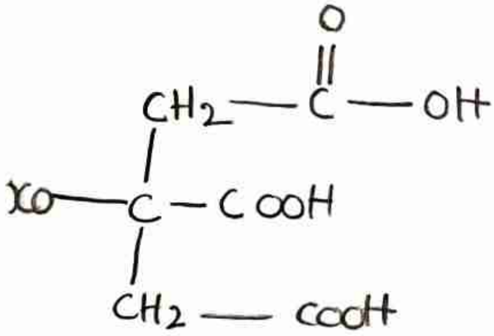
Acids

A GUIDE TO COMMON FRUIT ACID

CITRIC ACID

The main acid in citrus fruits is unsurpeisingly citric acid. Lemons and limes have particularly high levels of this compound. It is also the main acid in a number of berry fruits, including strawberries, raspberries and goossberries.

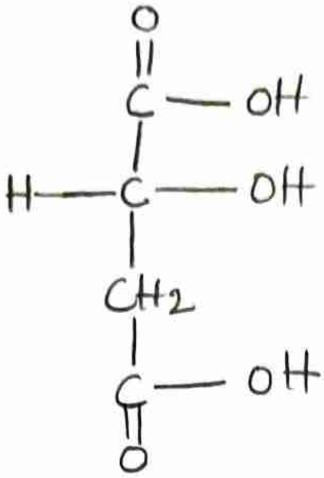
Structure:-



MALIC ACID

Malic acid is the main acid in most ston's fruits such as cherries. apricots, peaches and nactarines. it's also found in high amount in apples- and in lower amount in bananas. Though watermelons have a low acids content, their principal acid is also malic acid.

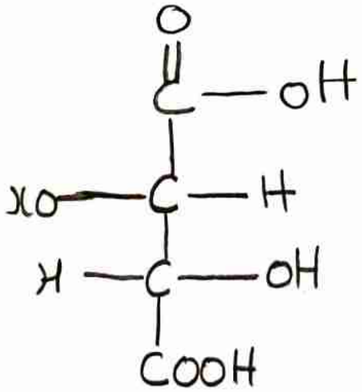
Structure:-



TARTARIC ACID

Tartaric acid is the principal acid in flever fruits than citric and malic acid. However. it is the main acid in grapes, which also contain malic acid. Red grapes. have higher levels of tartaric acid. The main acid of avacado and tamarind is also tartaric acid.

Structure:-

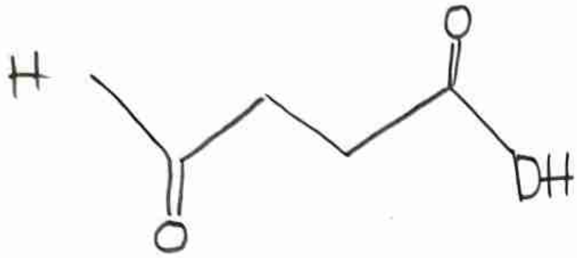


OTHER ORGANIC ACIDS

citric, malic & tataric acids are net the only organic acids present in fruit. 5number of other acids present in fruit. albelt in significantly smaller auaritides. To the right. a small selection of these compounds are shown. along with a brief note of some of the fruits in which they're often found.

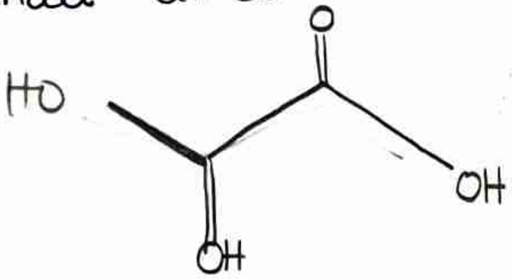
① SUCCINIC ACID

Apples and some berries



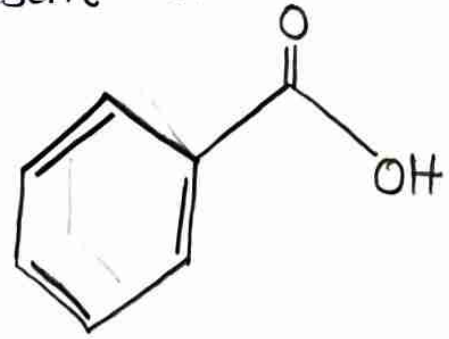
② OXALIC ACID

Small amounts in berries



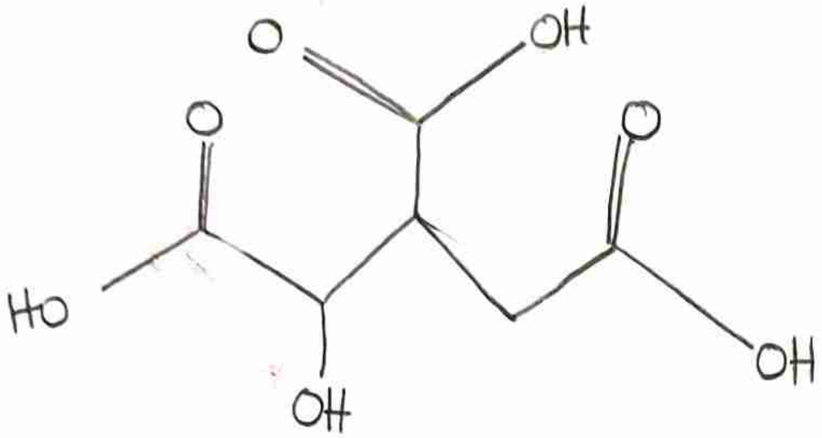
③ BENZOLIC ACID

Present in cranberries



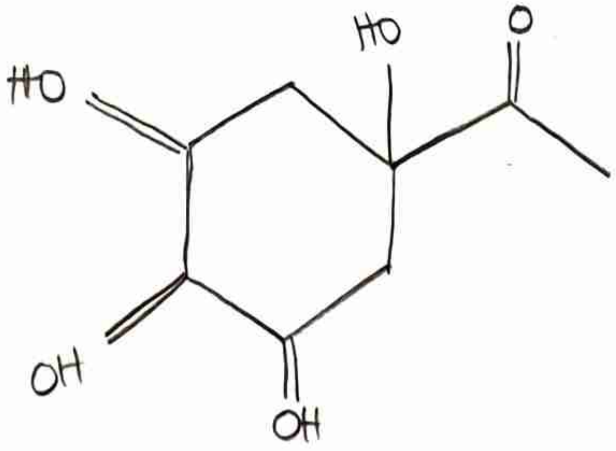
④ ISOCITRIC ACID

Present in black berries



⑤ QUINIC ACID

plums and kiwi fruits



The End

Government Degree college, For Women Karimnagar

Department of chemistry

Acadamic year [2021 - 2022]

A project on " Adverse effects with contents of soft drinks"

Submitted by,

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2) Nazva Uzma fatima B.sc (MPC), 3rd yr.
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4) K.Anusha B.sc(MPC), 3rd yr
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8) Harika BSC(MPC), 3rd yr
9) M.Tejaswini

Guided by :

G. Srinivas
Dept. of Chemistry

"Adverse effects with contents of soff Drinks"

Purpose

In recent days, several questions have been raised regarding the contents of soft drinks. the adverse effect of the contents of soft drinks on the health of the young has become an issue with the consumers. News reports often say that they contain harmful pesticide. I enjoy drinking soft drinks and wanted to confirm whether the charges imposed on the various soft drinks brands were true (or) not. As I am in touch with Qualitative analysis, and similar analysis methods, this knowledge helped me to do this project.

CONTENTS

INTRODUCTION

After the exit of coca-cola and pesico from the indian market in 1977, Gold spot, Limca and thumbs up were launched by the parle Group of companies. Since the beginning, soft drinks business was highly profitable which lured multinationals, namely coca-cola and pepsi into India. Over the Years they have launched many new brands of soft drinks in the Indian market. It is noted that majority of people drink sprite, Mirinda, Limca to give them a feeling of lightness while pepsi, thumbs up, coca-cola activate the pulse and brain.

THEORY

Soft drinks of different brands consists of alcohols, carbohydrates, carbondioxide, phosphate ions, etc. these soft drinks give a feeling of warmth, lightness and have a tangy taste which is enjoyed by everyone. Carbon dioxide is responsible for the formation of froth on shaking the bottle. The carbon dioxide gas is dissolved in water to form carbonic acid which is also responsible for the energy tangy taste. Carbohydrates are the naturally occuring organic compounds and are major sources of energy to our body. General formula of carbohydrates is $C_x(H_2O)_y$. On the basis of their molecule size carbohydrates are classifed as:-

→ Monosaccharides
→ Disacharides
→ poly-saccharides.

Glucose is a mono-saccharide with formula $C_6H_{12}O_6$. It occurs in free state in ripend grapes, in bones and also in many sweet fruits. It is also present in human blood to the extent of about 0.1%.

Sucrose is one of the most useful disaccharides in our daily life. It is widely distributed in nature in juices, seeds and also in flowers of many plants. The main source of sucrose is sugar can juice which contain 15-20% sucrose and suger beet.

- which has about 10-17% sucrose. The Molecular formula of sucrose is $C_{12}H_{22}O_{11}$. It is produced by a mixture of glucose and fructose. It is non-reducing in nature whereas glucose is reducing. Soft drinks are a bit acidic in nature and their acidity can be measured by finding their pH value. The pH values also depends upon the acidic contents such as citric acid and phosphoric acid.

~~THEORY~~

APPARATUS

i)- Test Tube

ii)- Test Tube Holder

iii)- Test Tube stand

iv)- stop watch

v)- Beaker

vi)- Burner

vii)- pH paper

viii)- Tripod stand

ix)- china Dish

x)- wire Gause

xi)- water Bath.

CHEMICALS REQUIRED

i)- Iodine solution
ii)- potassium Iodine
iii)- sodium Hydroxide
iv)- Fehling's A & B solution
v)- Lime water
vi)- concentrated HNO
vii)- Benedict solution
viii)- Ammonium Molybdate.

DETECTION OF pH

Experiment observation inference

1-2 drops of a sample of soft drinks of four brands were taken in a test tube and put on the pH paper. the change in the colour of pH paper was noticed and was compared with the standard ph scale.

SL NO	Brand name	colour	pH value	Nature
1.	coca cola	pink	1-2	acidic
2.	sprite	Orange	3	acidic
3.	7up	Orangish red	3-4	acidic
4.	Mountain Dew	Dark Yellow	3-2	acidic

Result:

soft drinks tested were acidic in nature. Different pH ~~values~~ levels indicated that the acidic content in each brand was different from the other. coco cola was found to be most acidic.

TEST FOR CARBONDIOXIDE

Experiment:

The bottle of each of the four soft drink wa opened, the gas that escaped was immediately passed through lime water.

SL-NO	Brand Name	change observed	time taken	Inference.
1.	Coca cola	lime water turned milky	26.5 sec	CO_2 is present
2.	Sprite	lime water turned milky	21 sec	CO_2 is present
3.	7up	lime water turned milky	20 sec	CO_2 is present
4.	Mountain Dew	lime water turned milky	30 sec	CO_2 is present

Result:

CO_2 in the dissolved state was found in all the four soft drinks. CO_2 is responsible for the tangy taste in soft drinks

chemical reaction:

$$Ca(OH)_{2\,(s)} + CO_{2\,(g)} \longrightarrow CaCO_{3\,(s)} + H_2O_{(s)}$$

TEST FOR GLUCOSE

Experiment:

Benidicts solution test: small samples of each of the four soft drinks were taken in test tubes and few drops of Benedicts reagent were added to each. The test tube was heated for few seconds.

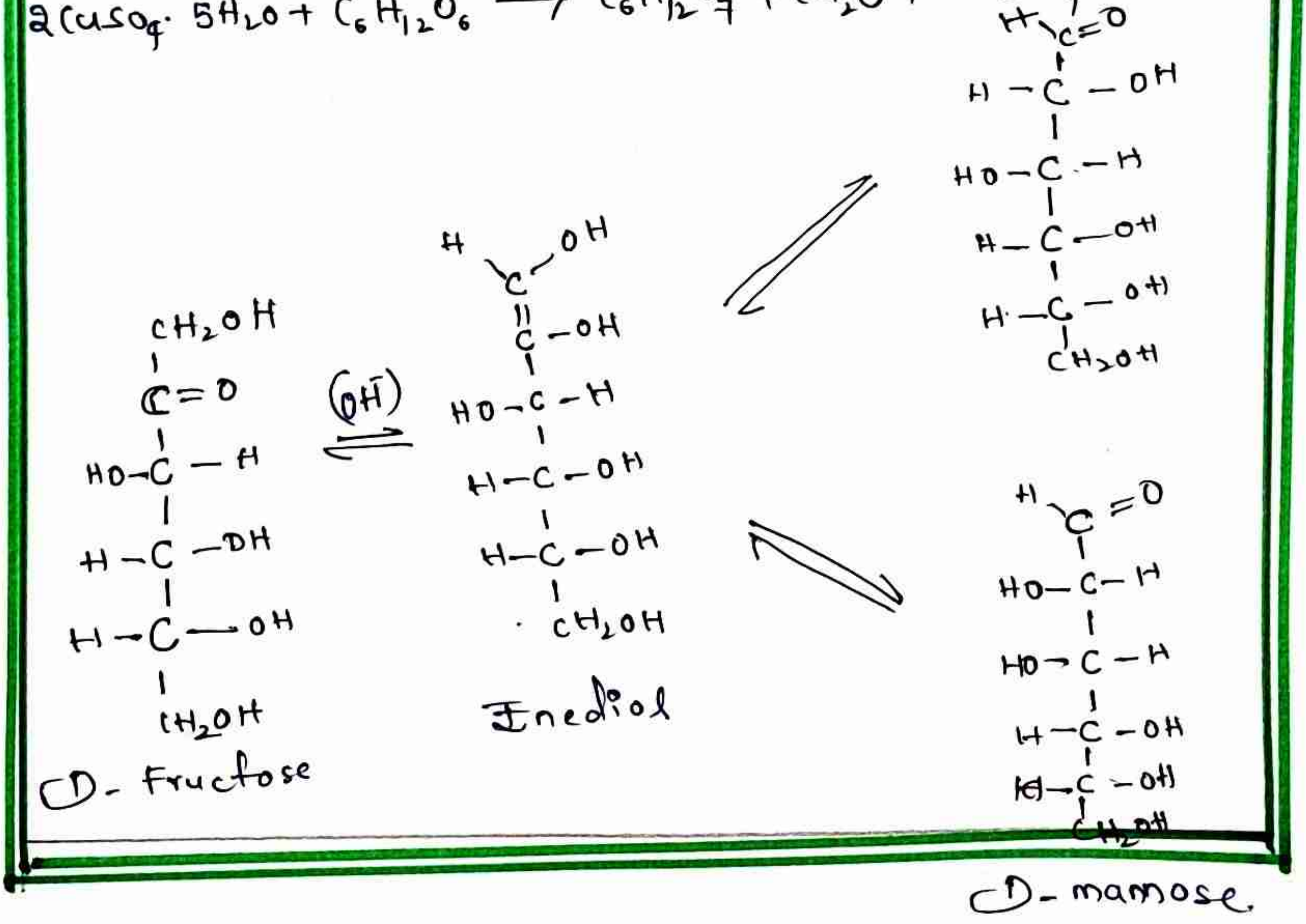
Sl No	Brand	Observation	Inference
1.	cocacola	Reddish colour precipitate	Glucose is present
2.	sprite	Reddish colour precipitate	Glucose is present
3.	7up	Reddish colour precipitate	Glucose is present
4.	Mountain Dew	Reddish colour priciptate.	Glucose is present

Result:

All the four samples contain glucose.

chemical reactions:

$$2CuSO_4 \cdot 5H_2O + C_6H_{12}O_6 \rightarrow C_6H_{12}O_7 + Cu_2O + 2H_2SO_4 + 8H_2O.$$



TEST FOR PHOSPHATE

Experiment:-

Small samples of each of the four brands of soft drinks were taken in separate test tubes & Ammonium molydate followed by concentrated Nitric acid (HNO_3) was added to it. the soln was heated.

sl-NO	Brand	Observation	Inference.
1.	coca cola	canary yellow precipitate	phosphate present
2.	sprite	canary yellow precipitate	phosphate present
3.	7up	canary yellow precipitate	phosphate present
4.	mountain Dew	canary yellow precipitate	phosphate present

Result:-

All the four soft drink contain phosphate.

chemical reaction:-

$$NaHPO_4 + 12\,(NH_4)_2MoO_4 + 21\,HNO_3 + 3H^+ \longrightarrow (NH_4)_3PO_4 \cdot 12MoO_3 + 21\,HN_4NO_3 + 12H_2O.$$

TEST FOR ALCOHOL

Experiment:

Small samples of each of the four brands of soft drinks were taken in separate test tube sand Iodine followed by potassium iodide and sodium Hydroxide (NaOH) solution was added to each test tube. The test tubes were heated in hot water bath for 30 minutes.

SL NO	Brand	Observation	Inference.
1.	coca cola	Yellow precipitate	Alcohol present
2.	sprite	Yellow precipitate	Alcohol present
3.	Jup	Yellow precipitate	Alcohol present
4.	Mountain Dew	Yellow precipitate	Alcohol present.

Result:

Traces of alcohol present in each of the four soft drinks.

Chemical reaction:

$$CH_3CH_2OH + 4I_2 + 6NaOH \rightarrow CH_8I_3 + HCOONa + 5NaI + 5H_2O.$$

TEST FOR SUCROSE

Experiment:
5ml samples of each brand of soft drinks were taken in separate china dishes and were heated very strongly.

SL NO	Brand	Observation	Inference.
1.	coca cola	Black residue	Sucrose present
2.	sprite	Black residue	Sucrose present
3.	Jup	Black residue	Sucrose present
4.	Mountain Dew	Black residue	Sucrose present.

Result:
The four brands of soft drinks contein sucrose but the amount of sucrose varies in each.

Chemical reaction:

$$C_{12}H_{22}O_{11} \rightarrow 12C + 11H_2O.$$

RESULT

After conducting several tests, it was concluded that the different brands soft drinks namely:

1. coca cola
2. sprite
3. 7up
4. Mountain Dew.

contain glucose, alcohol, phosphate, sucrose and carbon dioxide. All soft drinks are acidic in nature. On comparing the pH value of different brands coca cola is the most acidic and 7up. is least acidic of all the four brands taken. CARBON DIOXIDE Among the four samples of soft drinks taken, sprite has the maximum amount of dissolved carbon dioxide and 7up has the minimum amount of dissolved carbon Dioxide?

CONCLUSION

Glucose / Sucrose:

⇒ While sugar itself doesnot diabetes, high sugar intake raise blood glucose levels, which can lead to a variety of health problems including diabetes, high blood pressure, heart disease and stroke.

⇒ High sugar content in saft drinks leads to weight gain.

⇒ the high amount of sugar consumed through soft drinks lead to the development of bacteria that attack the teeth thus aggravating dental problems.

Phosphate:

⇒ High level of phosphorus in soft drinks can be especially hazardous because the kidneys are less able to excrete exess phosphorus, causing depletion of vital calcium. Excess phosphorus is therefore, one of the major contributing factors to the development of osteoarthritis.

⇒ phosphoric acid in soft drinks easily
dissolves tooth enamel.

⇒ the phosphoric acid and carbon dioxide
combination makes soft drinks highly acidic.
this reacts with the acids already
present in the stomach to create a
more acidic environment. in soft drinks,

⇒ the phosphoric acid in
reacts with the hydrochloric acid in
the stomach, causing indigestion, gas
and bloating.

Alcohol:
Trace of alcohol found in soft drinks
would not have any noticeable
effect on health.

pH on soft drinks:
⇒ the pH of soft drink ranges from
2.5-3.4 which generates a highly acidic
environment in the stomach. throghout
the digestive system, that starts
from the mouth and ends up at the
anus (liver, gallbladder and pancreas

play the role of accessory organs) only the stomach can resist an acidic environment up to pH 2.0. But before the acidity of soft drink reaches the stamach it passes through all the other organs involved in the digestive system thus causing an abnormal acidic environment. Hence the linings of the mouth, pharynx and esophagus are highly sensitive to acids.

GOVERNMENT DEGREE COLLEGE
FOR WOMEN
KARIMNAGAR

DEPARTMENT OF CHEMISTRY

PROJECT WORK

Topic : Hard AND SOFT ACIDS & BASES

Submitted To:

G. Jyothi Madam

Submitted by:

M.P.C. II Year

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   20077164441010
2. Ameti Mahanthi
   20077164441002
3. A. Ashwini
   20077164441001
4. **A. Anusha BZC II**
5. **B. Sangeetha BZC II**

GOVERNMENT DEGREE COLLEGE FOR WOMEN

KARIMNAGAR

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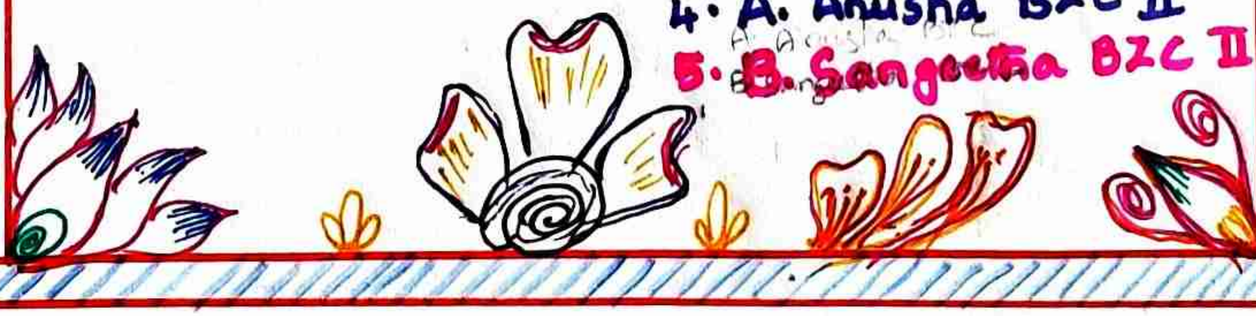

Contents

* Hard and soft acids and Bases (HSAB)
* classification of metal ions as Hard and soft acids and Bases.
* Pearson's concept of hardness and softness
* classifications of Acids and Bases as per Pearson's propositions.
* predicting the path of the reaction
* stability of Complexes:-

INTRODUTION :-

ACIDS AND BASES

About Acids and Bases:-

=> An acid is any substances that in water solution taste pour sour, changes blue litmus paper to red, reacts with some metals to liberate hydrogen reacts with bases to form salts and promotes chemical reactions. Acids

ex:- Hydrochloric acid

=> Base:- Any substances that in water solution is silppery to the touch taste bitter, changes the colour of indicator.

Eg:- turns red litmus paper blue

=> Using litmus paper we find acids and bases.

According to the Lewis theory of Acids and base.

⇒ A Lewis acid is a substance that can accept a pair of electrons to form a new bond. They are sometimes reffe to as electrophiles, (or) seekers of an additional electron pair.

⇒ A Lewis base is a substance that co donate a pair of electron to form a new bond.

ARRHENIUS THEORY :-

According to Arrhenius theory, acid is a substances that give H^+ ions on dissolv in the aqueous solution. it increases the concentration of H^+ ions in the solution.

BRONSTED - LOWRY THEORY :-

According to Bronsted - Lowry theory, acid is a substances which denotes an H^+ ions or a proton and form its conjugate base and the base is a substances which accept an H^+ ions or proton and forms its conjugate acid.

HARD AND SOFTACIDS AND BASES (HSAB)

Hard and Softacids and Bases (HASB)

This theory was proposed by pearson's

classification of metal ions as Hard and soft acid and Bases :-

In the study of metal coordination Complexes, chemists realised long back that some metal ions forms with some ligands stable Compounds.

pearson's Concept of hardness and softnes

R.G. pearson's classified metal ions and ligands instead of class-a and class b into hard and soft acids and bases. class-a are called 'hard' category and class b are called 'soft category'. Metal ions belonging to class a - belong to hard acids and ligands belong to hard bases.

Hard acids and bases posses small size, small polarizability. soft acids and bases posses large size and large polarizability.

Pearson's proposed a rule to predict the stability of the compounds formed between these acids and bases. This is called pearson's Hard soft Acid Bases rule (HSAB). This rule states that Hard acids react with hard bases, soft acids react with soft bases.

This means hard acids react with hard Bases and soft acids react with soft bases to form stable compounds. This explanation gives by Pearson is not a theory but it is simple rule which can be used to predict qualitavely relative stabilites of compounds formed between Acids and Bases.

Classification of Acids and Bases as per Pearson's propositions.

We have to remember one thing in classifying the acids and bases. The hardness or softness of acids and bases are only relative terms. These don't indicate any limits between them. This is because it is realised that besids hard and soft speceis there are intermediary type of species. These are called borderline acids and bases :

The hard or soft species belonging to same class may not have same level of hardness or softness.

In alkali metal ion group1 the hardness decrease from top to bottom. pearson's classification of acids and hardness bases is presented in the Table.

classification of acids and bases

Hard	Borderline	Soft
H^+, Li^+, Na^+, K^+, Be^+, AL^{3+}, Mg^{2+} Ca^{2+}, Sr^{2+}, Ti^{4+} Sc^{3+}, Cr^{3+}, Co^{3+} etc	Fe^{2+}, Co^{2+} Ni^{2+}, Cu^{2+} Zn^{2+}, Pb^{2+}, etc	Pd^{2+}, Pt^{2+}, Ag^+, CH_3Hg^+, Hg^{2+} Cu^+, Au^+, Cd^{2+} Cs^+, Pt^{4+}, etc

BASES

Hard	Borderline	Soft
F^-, Cl^-, OH^-, O^{2-} CO_3^{2-}, SO_4^{2-}, H_2O ROH, R_2O NH_3 RNH_2 etc	Br^-, NO_2^-, N_3^-, etc	H^-, CN^-, SCN^-, I^-, CO, R_3P R_2S, RS^-, $S_2O_3^{2-}$ SH^- etc

The Hardness and softness of Acids and bases.

The pearson's concept of hardness and softness, relate the hardness between hard-hard or soft pair species, but it does not indicate the relation between the strength of acids or the strength of the base.

Hard acids does not mean strong acid and soft acid does not mean weak acid, similarly hard bases does not mean strong base and soft base does not mean weak base. There is no direct relation between hardness and softness and strong. But the base strength of SO_3^{2-} is more than the base strength of F^-,

If a competition arises between the strength of acids and bases, and hardness or softness of acids and bases.

$SO_3^{2+} + H-F \rightleftharpoons H-SO_3^- + F^-$ Keq $= 10^4$

soft Hard-Hard soft-soft Hard

In the above reaction soft base SO_3^{2-} - displaced hard base F^-, from hard acid H^+. This displacement is against hard soft rule SO_3^{2-} ion is stronger than F^- ions is the reason for this. such reactions actually take place as per strength of acids and bases only.

Applications of HASB Principle -

stability of compounds / Complexes -

predicting the Feasiblity of a Reaction

Even though the rule poroposed by Pearsons regarding hard-soft acid base concept is only empirical, it is possible to obtain large information about chemical reactions, as well as about the stability of the compounds and the complexes.

The exothermic Nature of the reaction :-

In the reaction between CsF LiI, similarly between HgF_2, BeI_2, heat is liberated. This exothermic nature

(i) $CSF + LiI \longrightarrow LiF + CSI$ $\Delta H = -138$ KJ/mol

S-H H-S $\longrightarrow$ H-H S-S

+501 +347 $\longrightarrow$ +573 +335 KJ/mol

(atomization enthalphy)

(ii) $HgF_2 + BeI_2 \longrightarrow BeF_2 + HgI_2$

S-H H-S H-H S-S

+535 +577 +1262 +292 KJ/mol

The above reactions being exothermic go from left to right. The strong bond formed between Li^+, F^- (H-H), between Be^{2+}, F (H-H) is responsible. This is also indicated by the high atomization enthalpies values (LiF = +573 mol, BeF_2 = +1262 KJ/mol)

predicting the path of the reaction:-

(i) $H^+ + CH_3Hg\text{-}OH \longrightarrow H\text{-}OH + CH_3Hg^+$

(H) (S-H) (H-H) (S)

(ii) $H^+ + CH_3Hg\text{-}SH \longleftarrow H\text{-}SH + CH_3Hg^+$

(H) (S-S) (H-S) (S)

Reaction (i) goes from left to right and (ii) from right to left.

stability of complexes :-

Examples :- AgI_2^- stable , AgF_2^- does not form

S-S S-H

CoI_6^{3-} is less than CoF_6^{3-}

(H-S) (H-H)

Conclusion :- By analysing data about Acids and Bases. I have to came to know that Acids and bases do not only take place in scientific laboratories; they are used in more place in today's society.

Acids and bases are involved in our everyday life in everything from digestion of food to the medicine. you take and also in cleaning product we use.

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Govt. Degree college for women's Knr.

Chemistry Project

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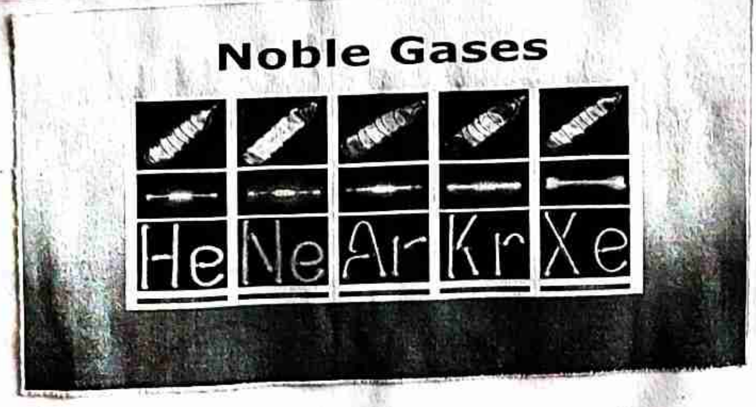
class :- BZC Ist year IInd sem

Topic :- Noble Gases

Guided by :- G. Jyothi
Department of chemistry

The Noble Gases



Noble gas ÷

Introduction ÷ Any of the seven chemical elements that make up group 18 (VIIIa) of the Periodic table are considered noble gases. The elements are helium (He), neon (Ne), argon (Ar), Krypton (Kr), xenon (Xe), radon (Rn), and oganesson (Og). Noble gases are colourless, odourless, and testless nonflammable gases. Because it was assumed for decades after their discovery that they couldn't link to other atoms and that their atoms couldn't combine with those of other elements to Produce chemical compounds they were allocated to group 0 in the Periodic table.

Group 18 is a better classification based on their electrical Properties and the discovery that Some of them do from compounds.

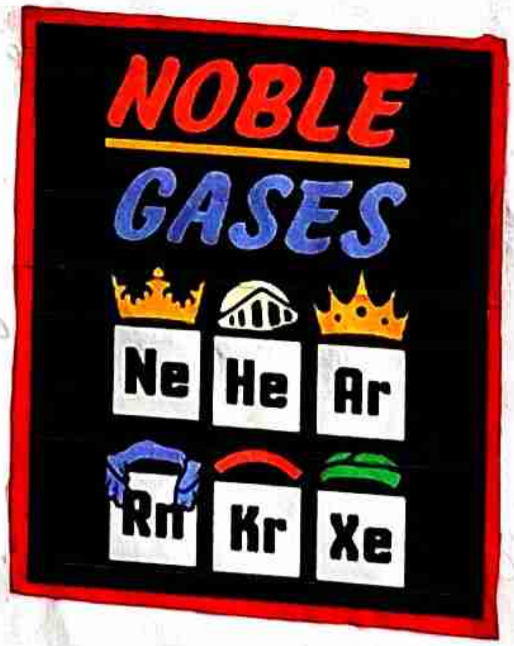
Air contains neon, argon, krypton and xenon, which are obtained by liquefaction and fractional distillation. cryogenic important Source of helium. Radioactive decay of heavy elementes Such as radium, thorium, and uranium Produces radon, a radioactive noble gas. Element 118 is a radioactive element Produced by the acceleration of Particles and their impact on the target. Noble gas alien Sources may be discovered in the future.

The least reactive chemical elementis are noble gases. Because the atoms have a full valence electron shell, they are Partically inert and have minimal tendency to adsorb or contribute electrons to from chemical bonds.

Explanation ÷

When elements react, their atoms complete their uter shells by lossing, gaining or already sharing lectrons. The atoms of noble gases alredy have omplete outer shells. So they have no tendency to lose. gain, or share electrons. this is why the noble gases are inert and do not take Part in chemical reactions.

⇒ electronic configirations ÷ of elements in groups 1, 7 and 0.



- atoms of group 1 and 7 elements have incomplete outer shells (so they are reactive).
- atoms of group 0 elementes have complete outer shells (so they are unreactive).

Properties and uses of noble gases ÷

The main Properties of the noble gases include.

- they have low densities.
- they are inert, so they are not flammable.

many uses for the noble gases are linked to one or more of these Properties.

Helium ÷

Helium is used as a lifting gas in Party ballons and airships. Helium is:

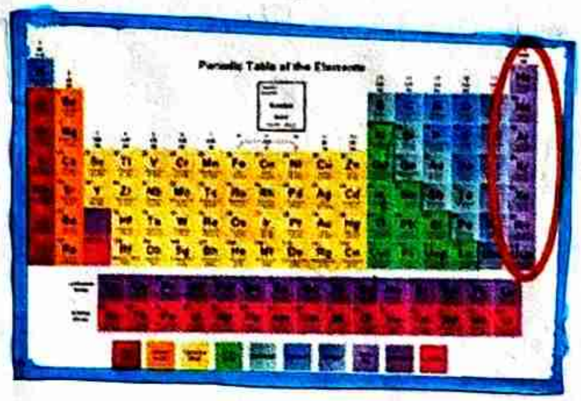
- less dense than air, so balloons and airships is rise.
- non-flammable so the helium cannot set on fire.

Argon ÷

Argon is used as a 'shield gas' when welding ieces of metal together. Argon is:

) denser than air, so it stops air getting to he metal.

) inert, so the hot metal cannot oxidise and the spoil the weld.



The chemical Properties ÷

Noble gases are odorless, colorless, nonflammable and monotonic gases that have low chemical reactivity.

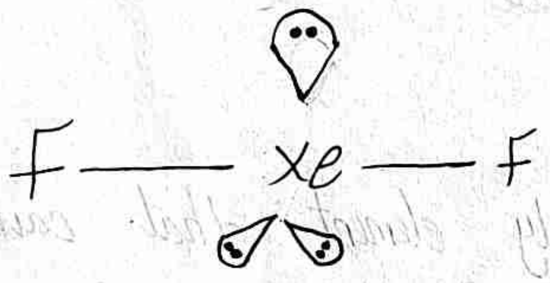
Atomic number	2
Element	Helium
Number of electron	2
Atomic number	10
Element	Neon
Number of electron	2,8
Atomic number	18
Element	Argon
Number of electron	2,8,8
Atomic number	36
Element	Krypton
Number of electron	2,8,18,8
Atomic number	54
Element	Xenon
Number of electron	2,8,18,18,8
Atomic number	86
Element	Radon
Number of electron	2,8,18,32,18,8

The full valence electron shells of these atoms make noble gases extremely stable and unlikely to from chemical bonds because they have little tendency to gain or lose electrons.

Although noble gases do not normally react with each elements exceptions. xe may from compound with fluoride and oxide.

Example 1 : Xenon fluorides :

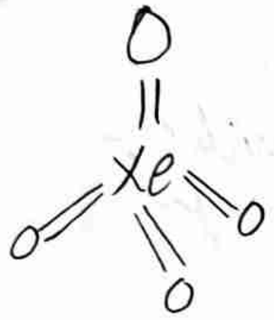
Xenon Difluoride (XeF_2)



- Dense white crystallized solid
- Powerful fluorinating agent
- Covalent inorganic fluorides
- Stable xenon compound
- Linear geometry
- Moisture sensitive
- Low vapour Pressure
- Decomposes on contact with light or water vapour.

Example 2 : xenon oxide :

xenon Tetroxide (XeO_4) :



⇒ yellow crystalline Solide

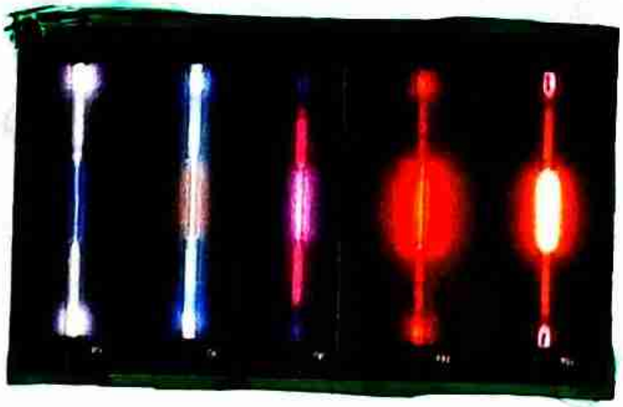
⇒ Relatively Stable

⇒ oxygen is the only element that can bring xenon up to its highest oxidation state of +8

Two other Short-lived xenon compounds with an oxidation State of +8, XeO_3F_2. and XeO_2F_4, are Produced in the reaction of xenon tetroxide with xenon hexafluoride.

xample 3: Radon compounds :-

Radon difluoride (RnF_2) is one of the few
eported compounds of radon. radon reacts
adily with fluorine to from a solid compounds
ut this decomposes on attempted vaporization
nd its exact composition is uncertain. The
sefulness of radon compounds is limited
ecause of the noble gas's radioactivity. The
ongest lived isotope, ^{222}Ra, has a half-life of
nly 3.82 days.



Noble gas (group 18) :

⇒ All elements exist in the atomic from and highly stable.

⇒ xe can form a few complexes due to it's modest electronegativity.

⇒ The large size of xe provides coordinati
unsaturation to form coordination unsaturation
to numbers up to 8, $[Xef_8]2$

⇒ Alternating oxidation states remain in stab
as in the halogens.

⇒ Similar to N, the highest oxidation state (VIII
is only accessible is bonding occurs to decrea
the electron density on xe.

⇒ xenon oxides are acidic, xenon hydrides are non-existent, and only xenon fluorides can b
used to form other xenon halogen complexes.

Noble gas Properties ÷

The noble gases are relatively nonreactive. In act, they are the least reactive elements. on he Periodic table. This is because they have a omplete valence shell. They have little tendency to gain or lose electrons. in 1898, Hugo Erdmann oined the Phrase of these noble gas" to reflect he low reactivity of these elements, in much the same way as the noble metals are less reactive than other metals. The noble gases have high ionization energies and negligible electronegativities. The noble gases have low boiling Points and are all gases at room temperature.

uses of the noble gases ÷

The noble gases are used to from inert atmospheres, typically for arc welding, to Protect specimens, and to deter chemical reactions. The elements are used in lamps, such as neon lights and krypton head lamps, and in lasers. Helium is used in ballons, for deep-seadiving air tanks, and to cool.

Sources of the Noble gases ÷

Neon, organ, krypton, and xenon all are found in air and are obtained by liquefying it and Performing fractional distillation. The major source of helium is from the cryogenic sepration of natural gas. Radon, a radioactive noble gas, is Produced from the radioactive decay of heavier elements, including radium, thorium, and uranium. Element 18 is a man-made radioactive element, Produced by striking a target with accelerated Particles. In the future extraterrestrial sources of noble gases may be found.

Conclusion :

⇒ Xenon is a noble gas.
⇒ It is colorless and odorless.
⇒ It has a full outer electron shell and it is not very reactive.
⇒ xenon was discovered in 1998.
⇒ Noble gas elemental rations indicate that

MORB$ have higher He concentration than OIB$ that cannot be explanied away by simple.

Analysis of calcium content in milk sample

Mentor:A.Shalini, Asst.Prof. of Chemistry

Students

Maneesh.Arya	Life sciences I Year
Maneesha.G	Life sciences I Year
Swapna	Life sciences I Year
Gouthami	Life sciences I Year
Navya	Life sciences I Year

Aim: Determine the Calcium content in milk.

Introduction:

The estimation of calcium content is based on complexometric titration. It is determined by titrating witha standard solution of ethylene diamine tetra acetic acid (EDTA) which is a complexing agent. EDTA can form four or six coordination bonds with a metal ion.

Requirements:

Water sample

Burette 25-30ml

Glass funnel

Pipette 1ml

Flask

Dropper

Measuring cylinder

Reagents: EDTA, Eriochrome Black-T, NH_2CL, Ammonia Buffer, Magnesium Carbonate, 90% ethyl alcohol, Distilled water.

Reagent preparation:

1. EDTA solution: 0.5M
2. Eriochrome Black-T: 0.4gm Ericrome Black T, 4.5 gm hydroxylmine hydrochloride add in 100ml 95% ethyl alcohol.

3. Ammonia Buffer: Stock A: 16.9gm of NH_4CL in 143ml of conc. NH_4OH, Stock B: 1.25gm magnesium salt of EDTA dissolve in 50 ml distilled water. Mix both stock solutions and dilute to 250ml with DDW. Dilute 10ml of the solution to 100ml with DDW.

Procedure:

1. The burette is filled with standard EDTA solution to the zero level.
2. Take 10ml sample milk in flask. Add 1ml Ammonia buffer.
3. Add 5 to 6 drop of Ericrome black – T indicator. The solution turns into wine red colour.
4. Note the initial reading.
5. Titrate the content against EDTA solution. At the end point colour change from wine red to blue colour.
6. Note the final reading and record it. Repeat the process till we get concordant value.

Calculations:

S.No.	Milk sample (10ml)	Initial Value	Final Value	Ml of EDTA
1		0	0.8	0.8
2		0	0.8	0.8

Calcium concentration=0.04M
=1.6gm/1000mL

Observation:

Determination of Hardness of water samples samples collected by students

Mentor:A.Shalini, Asst.Prof. of Chemistry
Students

Geethanjali	Life sciences IYear
Supriya	Life sciences IYear
Sandyarani	Life sciences IYear
Nandini	Life sciences IYear
Krupa	Life sciences IYear

Aim: Determine the total hardness of water samples collected by students.

Introduction:

Hardness in water is due to the presence of dissolved salts of calcium and magnesium. It is unfit for drinking, bathing, washing and it also forms scales in boilers. Hence it is necessary to estimate the amount of hardness producing substances present in the water sample. Once it is estimated, the amount of chemicals required for the treatment of water can be calculated. The estimation of hardness is based on complexometric titration. Hardness of water is determined by titrating with a standard solution of ethylene diamine tetra acetic acid (EDTA) which is a complexing agent. EDTA can form four or six coordination bonds with a metal ion. Two type of hardness is present in water first is temporary hardness and second is permanent hardness. Temporary hardness is due to the presence ofbicarbonates of calcium and magnesium ions. It can be easily removed by boiling. Permanent hardness is due to the presence of chlorides and sulphates of calcium andmagnesium ions. This type of hardness cannot be removed by boiling.

Requirements:

Water sample
Burette 25-30ml
Glass funnel
Pipette 1ml

Flask

Dropper

Measuring cylinder

Reagents: EDTA, Eriochrome Black-T, NH_2CL, Ammonia Buffer, Magnesium Carbonate, 90% ethyl alcohol, Distilled water.

Reagent preparation:

1. EDTA solution: 0.5M
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3. Ammonia Buffer: Stock A: 16.9gm of NH_4CL in 143ml of conc. NH_4OH, Stock B: 1.25gm magnesium salt of EDTA dissolve in 50 ml distilled water. Mix both stock solutions and dilute to 250ml with DDW. Dilute 10ml of the solution to 100ml with DDW.

Procedure:

1. The burette is filled with standard EDTA solution to the zero level.
2. Take 50ml sample water in flask. If sample having high Calcium content then take smaller volume and dilute to 50ml.
3. Add 1ml Ammonia buffer.
4. Add 5 to 6 drop of Ericrome black – T indicator. The solution turns into wine red colour.
5. Note the initial reading.
6. Titrate the content against EDTA solution. At the end point colour change from wine red to blue colour.
7. Note the final reading and record it. Repeat the process till we get concordant value.

Calculations:

S.No.	Water sample (50ml)	Initial Value	Final Value	Ml of EDTA
1	Bore water	0	4.1ml	4.1
2	Tap water from students home	0	2.0	2.0

Total hardness of bore water mg/L ($CaCO_3$ Scale) = 0.041M
0.0041gm /100mL or 41ppm
Total hardness of tap water =0.017M
=0.0017gm/100mL or 17ppm

Observation:

Analysis of Vitamin C in Orange Juice

Mentor: A. Shalini, Asst.Prof. of Chemistry

Students

Pallavi	Life Sciences I Year
SatyaPriya	Physical Sciences I Year
Raashi	Physical Sciences I Year
Vyshanavi	Physical Sciences I Year
Gouthami.I	Life Sciences I Year

Introduction

This method determines the vitamin C concentration in a solution by a redox titration using iodine. Vitamin C, more properly called ascorbic acid, is an essential antioxidant needed by the human body (see additionalnotes). As the iodine is added during the titration, the ascorbic acid is oxidised to dehydroascorbic acid, whilethe iodine is reduced to iodide ions.

$$\text{ascorbic acid} + I_2 \rightarrow 2\,I^- + \text{dehydroascorbic acid}$$

Due to this reaction, the iodine formed is immediately reduced to iodide as long as there is any ascorbic acid present. Once all the ascorbic acid has been oxidised,

the excess iodine is free to react with the starch indicator, forming the blue-black starch-iodine complex. This is the endpoint of the titration.

The method is suitable for use with vitamin C tablets, fresh or packaged fruit juices and solid fruits and vegetables.

Solutions Needed

Iodine solution: (0.005 mol L^{-1}). Weigh 2 g of potassium iodide into a 100 mL beaker. Weigh 1.3 g of iodine and add it into the same beaker. Add a few mL of distilled water and swirl for a few minutes until iodine is dissolved. Transfer iodine solution to a 1 L volumetric flask, making sure to rinse all traces of solution into the volumetric flask using distilled water. Make the solutionup to the 1 L mark with distilled water.

Starch indicator solution: (0.5%). Weigh 0.25 g of soluble starch and add it to 50 mL of near boiling water in a 100 mL conical flask. Stir to dissolve and cool beforeusing.

Equipment Needed

burette and stand 10 mL pipette

10 mL measuring cylinders250 mL conical flasks

1. pipette a 10 mL aliquot of the sample solution into a 250 mL conical flask and add about 150 mL of distilled water and 1 mL of starch indicator solution.
2. Titrate the sample with 0.003 mol L^{-1} iodine solution. The endpoint of the titration is identified as the first permanent trace of a dark blue-black colour due to the starch-iodine complex.
3. Repeat the titration with further aliquots of samplesolution until you obtain concordant results (titres agreeing within 0.1 mL).

Calculations

1. Calculate the average volume of iodine solution usedfrom your concordant titres.
2. Calculate the moles of iodine reacting.
3. Using the equation of the titration (below) determinethe number of moles of ascorbic acid reacting.

ascorbic acid + $I_2 \rightarrow 2\,I^-$ + dehydroascorbic acid

S.No.	Orange juice (10ml)	Initial Value	Final Value	Ml of Iodine
1		0	11	11
2		0	11	11

Molarity of vitamin C=0.0033M
=0.650gm/10mL