

**A BRIEF STUDY ON DE MONITISATION AND ITS IMPACT ON COMMON MAN
LOCATED IN BHUPALAPLLI DISTRICT AREA AND ITS SURROUNDING VILLAGES**

Student Project submitted for
Bachelor of Commerce

By

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DEPARTMENT OF COMMERCE

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Introduction of the Study:

In India the demonetization move has been taken to curb the menace of black money and fake notes by reducing the amount of cash available in the system. It is also interesting to note that this was not the first time the Government of India has gone for the demonetization of high-value currency. It was first implemented in 1946 when the Reserve Bank of India demonetized the then circulated Rs 1,000 and Rs 10,000 notes. The government then introduced higher denomination banknotes in Rs 1000, Rs 5000 and Rs 10000 in a fresh avatar eight years later in 1954 before the Morarji Desai government demonetized these notes in 1978.

On November 8 evening, Prime Minister Modi, in his televised address to the nation, made Rs 500 and Rs 1000 notes invalid, saying that it was aimed at curbing the “disease” of corruption and black money which have taken deep root. People holding notes of Rs 500 and Rs 1,000 can deposit the same in their bank and post office accounts from November 10 till December 30. All notes in lower denomination of Rs. 100, Rs. 50, Rs. 20, Rs. 10, Rs. 5, Rs. 2 and Re. 1 and all coins continued to be valid, and new notes of Rs. 2,000 and Rs. 500 were introduced. There was no change in any other form of currency exchange be it cheque, DD, payment via credit or debit cards etc.

Following the announcement, there were huge crowds outside ATMs across the country as people lined up to withdraw currency of smaller denominations. Banks were advised Sunday to increase the Cash Withdrawal limit at ATMs from the existing Rs 2000 to Rs 2500 per day in the recalibrated ATMs. The weekly limit of Rs. 20,000 for withdrawal from Bank accounts has also been increased to Rs 24,000 and the limit of Rs 10,000 per day has been removed. The exchange limit over the counter has also been increased from the existing Rs 4000 to Rs 4500.

Demonetization:

Demonetization is the act of stripping a currency unit of its status as legal tender. Demonetization is necessary whenever there is a change of national currency. The old unit of currency must be retired and replaced with a new currency unit.

India is not a stranger to demonetization as Prime Minister Narendra Modi recently marked the third time in history that currency notes have been demonetized in India. However, the recent currency withdrawal of Rs 500 and Rs 1000 notes is the biggest currency ban in India’s history, making more than 80 percent of hard cash in circulation effectively worthless.

Statement of the problem:

Demonetization is a policy enacted by the Government of India to tackle the black money in the economy, by withdrawing the old Rs. 500 and Rs. 1000 as an official mode of payment. Every Indian has to know the policy of demonetization. Is the policy effecting positively or adversely on their life? Is the policy benefit able or not, to the nation in the long run? Has the government taken correct step to tackle the black money? Is the policy only step to tackle the black money? If the people have the knowledge of demonetization, it can be supportable to the government to implement the demonetization policy successfully.

Need for the study:

To understand the policy of demonetization policy it is important to know the opinion of the public in rural areas of Bhupalapally district and surrounding villages in Telangana state on demonetization policy as well as the affects of withdrawing Rs.500 and Rs.1000 notes of a sudden step on common public.

Objectives of the study:

1. To know the public opinion on Long term benefits for the economy with demonetisation policy.
2. To know the financial loss occurred to the common man with the demonetisation policy.
3. To know the common public troubles like time hazards, problems in exchanging the currency by sudden demonetizing of currency.
4. To know the awareness on Indian government policy to eliminate black money gotten from money laundering and terrorist financing activities, and promote a cashless economy.
5. Public flexibility according to the government policies.

Sources of the data:

The study will be based on both primary and secondary data, Primary data will be through a structured questionnaire and used to get views from employees, business men, daily wage earners and farmers.

Secondary data constitutes the major source of the study by reports, websites etc on demonetisation.

Research methodology:

The Sample includes 21 employees, 21 business men, 07 daily wage earners and 13 farmers in Bhupalapally district and surrounding villages. The sample selected at random, as per convenience while ensuring the sample a representative of all the categories of people to ensure its representative character.

The questionnaire prepared based on the preliminary interviews of common public for eliciting the views of them at their work places.

The collected data analyzed, interpreted in the significant manner. For analyzing the data, statistical techniques like percentages, ratios, and averages has been used. Foreffective interpretation of the data graphical presentations have been used where ever necessary. Test of significance between the means of semi literates and illiterates has been carried out.

Result Analysis of the study:-

The method best suited for our research objective, due to the flexibility and immediacy of response, was a survey. In order to test ideas about how is demonetisation policy working? It has tested sixty two people (fifty males and twelve females). The public marked the feeling that demonetisation makes them feel, according to the choices shown on the example survey below.

As the sample for my research study located in rural area and most of the respondents are semi literates and illiterates, to collect non ambiguity data the questionnaire has prepared in their mother tongue i.e. in Telugu.

The sample consists of following groups

<i>Sl. No</i>	<i>Description</i>	<i>Total No</i>
A	Total Sample	62
	Gender Wise	
a.	Male	50
b.	Female	12
	Profession wise	
a.	Employees	21
b.	Business men	21
c.	Daily Wage earners	07
d.	Farmers	13

Scope and Limitations of the Study

Scope: -

The research work has taken up to know the public opinion from the area covered i.e. in Bhupalapally surroundings (prof. Jayashankar district). In the 62 no. of sample gender (male & female), various professions (employees, business men, farmers & daily wage earners) and finally 3 divisions of age(00-30 years, 31-50 years, 51-70 years and above 70 years) have been covered to collect optimized data for the research study.

Limitations of the study:

1. Because of the time limit, this research was conducted only on small sample; only sixty two people and limited categories have been taken and might not represent the majority of the population.
2. It would be better if it was done in a longer time.
3. Research is limited to only Bhupalapally and its surroundings.

Conclusion:-

The demonetization undertaken by the government is a large shock to the economy. The impact of the shock in the medium term is a function of how much of the currency will be replaced at the end of the replacement process and the extent to which currency in circulation is extinguished. While it has been argued that the cash that would be extinguished would be “black money” and hence, should be rightfully extinguished to set right the perverse incentive structure in the economy, this argument is based on impressions rather than on facts.

Majority of the common man feel some sort of inconvenience with the move but they are welcoming with the view of nation welfare any have, to succeed in the policy of preventing black money further required steps has to be taken up by the Indian government and also in the mean time the government has to be taken care of common and honest people in the country by providing new currency especially small denomination currency.



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TITLE: GST AND ITS CONSEQUENCES

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విషయ సూచిక

క్రమ.సంఖ్య	విషయం	పేజీ. నెం.
1	పరిచయం	1 - 5
2	Review of literature	6
3	వివరాల విశ్లేషణ	7 - 8
4	గ్రా. రి. గ్రా. వల్ల (మొదటిసారి)	9 - 10
5	గ్రా. రి. గ్రా. వల్ల నష్టాలు	11 - 13
6	methodology, data collection, experts opinions	
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(హైదరాబాద్ యర్రయ్యల రాజ్యము నుండి) బయట
 వియ్య నాటికి కేంద్ర లక్షితములైన అంశ (హైదరాబాద్) జిల్లా నా

అయితే సోషలిజంను 2004 నవంబర్ లో ఆగ్రి-చిత్తూరు జిల్లా కేంద్రానికి సమర్పించారు. 2011లో జిఎస్టీని అయితే చేసారును విజయం 115 వ రెవెన్యూ సమగ్ర బిల్లును (హౌస్ మంజూరు లోక్ సభలో ప్రవేశపెట్టారు. ఆ సమయంలో ప్రతిపక్షం అప్పటి బిజెపి జిఎస్టీ బిల్లుని తీవ్రంగా ప్రతిఘటించింది. అప్పుడు మార్గదర్శక శ్రద్ధా సూక్ష్మ 2013 లో బిల్లు సమగ్ర నివేదికను సమర్పించారు.



యాక్చువల్ జిఎస్టీ.... మోదీ ఆయన

→ 2014లో లోక్ సభలో రద్దు కావడంతో జిఎస్టీ బిల్లుకు ఆమోదం లభించలేదు. తరువాత మోదీ నెరంగేరిలో కత్తి (పట్టుకోవడం) పెట్టాడంటే అర్థం అవుతుంది. బిల్లును ప్రవేశపెట్టడం జరిగింది. అప్పుడు లోక్ సభలో జిఎస్టీ బిల్లు ఘోరంగా తిరగబడింది. చివరకు 2016 ఆగస్టులో జిఎస్టీ బిల్లును మార్గదర్శక శ్రద్ధా సూక్ష్మ ఆమోదం లభించింది.

జిఎస్టీ రూపకల్పన.... ఆసిమండాన్

→ ప్రఖ్యాతి అర్జిత శాస్త్రవేత్త ఆసిమండాన్ సూక్ష్మ జిఎస్టీ (పథాన రూపకల్పన). సూక్ష్మగానూ జిఎస్టీ ఎట్టి విధానాలను పరిశరయిస్తే వర్గాలు



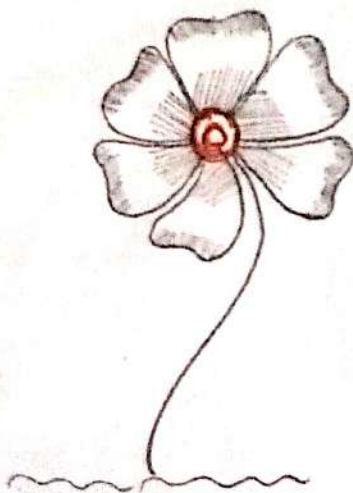
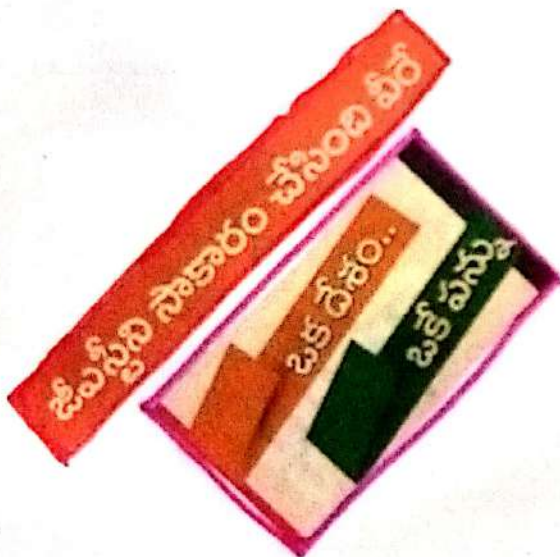
జీవన్మర్య రూపశిల్పి అసిమదాన్

→ ಮೂಲ ರಾಷ್ಟ್ರ ಪ್ರಭುತ್ವಗಳು, ಅರ್ಜಿ ಸಂಸ್ಥೆಗಳ ಸಹಕಾರದೊಂದಿಗೆ
ಅಂತರರಾಷ್ಟ್ರೀಯ ರಾಷ್ಟ್ರೀಯ ಅಭಿವೃದ್ಧಿ ಮಂಡಳಿಗಳಿಗೆ ಹಿತ ಕೊಡುವ
ವಿಧಾನವಿದೆ. ೨೦೧೧ ರ ವ್ಯವಹಾರದಂತೆ ಮೂಲ ಅಭಿವೃದ್ಧಿ ರಾಷ್ಟ್ರೀಯ
ಅಸೆಂಬ್ಲಿಗೆ ಸಂಬಂಧಿಸಿದಂತೆ ಸಹಕಾರ ನೀಡುವ ವಿಧಾನವಿದೆ.
ಇದನ್ನು ೨೦೧೨ ರ ವ್ಯವಹಾರದಂತೆ ೨೦% ವರಗೆ ಮೇಲೆ ಹೆಚ್ಚಿಸುವ
ವಿಧಾನವಿದೆ.

ಅಕ್ಷರ ಅಕ್ಷರ ಬಿಡಿ

➤ భూకలహేళ పేర్లు చరిత్రలు శుభాకారం జూన్ 20 నా అద్భుతంలే
12 గంటలపే సరికొత్త శకం అమెరికాలోమొంది. దీనిని రాష్ట్రపతి ట్రెంట్
మొఖల్లి, టెడ్డాని నరేంద్ర మోడి కాలం జమిన్లో లావనంగా మిట
నోకొ అమెరికాలోచిలదట చివరింది. టాటాఫ్ ఒక గంట పాటు చివరిన
కార్నెల్ మోల్ అర్జున్ మోల్ అటర్ బెల్ట్ . టెడ్డాని మోడి, రాష్ట్రపతి
టెడ్డాని కలసి జమిన్లో నా అమలు చేయటం చివరింది. చివర పాటు
పార్లమెంట్ సోలల్ యల్ ఆ దన్న సేధ్యులు అలా కలసిజమిన్
అమలుమే ఎంతగానో వేగి చేయటం చివరింది ఈ విధంగా మే
అమలునాల్లాగానో జమిన్ అమలుమే రాని పార్లమెంట్.

సంసకరావేం తెలియనిన జింట్లో అవలం వెనుకవలం ఎంతో ఇల్లవేయలి
 కైట్ల మెయలం ఎంతో అభిరూపం... ఇల్లవేయలి నల్లమెయలం వేయి చేయి
 చేయి చేయింది వారి వాడై



మొత్తం కార్యదర్శి
పి. చిత్తూరు



→ 0.5.1 అందులలో వచ్చిన ఆరువారాల ఏ వస్త్రపున విశ్లేషణ అయి
 టంచేయడం జరిగిందో ఎవరికైనా తెలుసు. దేశ వ్యాప్తంగా వస్త్రపునల పన్ను
 (సింపుస్ట్) జూలై 1 నుంచి అందులలోకి వచ్చింది. మొత్తం 1,211 వస్త్ర
 పునలపై పన్ను రేట్లను నిర్ణయించాడట. వయస్కం తరాల సహజ
 జుట్టు రేట్లను క్రొస్సిల్ (వకలెటరు) 5 నుంచి 28 శాతం వరకు పన్నులు
 వర్తిస్తాయి.

ఏ వస్త్రపు ఏ శాబులో



0%

అపర ధాన్యాలు,
 కూరగాయలు,
 తనగ పిండి,
 గోధుమలు,
 మైదా, పెరుగు,
 లబ్బి, మజ్జిగ,
 వన్నీర్, తేనె, ఉప్పు, చీపురు, కుంకుమ,

పన్ను లేని వస్త్రపులు

కాటుక, చిన్నారుల ద్రాయింగ్ బుక్స్, విద్యా
 సేవలు, వైద్య సేవలు, స్థాంపులు, దస్తావే
 జాలు, ముద్రించిన పుస్తకాలు, వార్తా పత్రి
 కలు, గాజులు, మెట్రో రైళ్లు, లోకల్ రైళ్లు,
 రైలులు, లాజీ మాంసం, చికెన్, గుడ్డు,
 పండ్లు, బ్రెడ్.



5%

టీ, కాఫీలు,
 పంచదార,
 మసాలాలు,
 వన్నీర్ ప్యాకెట్,
 పాలపొడి, పిజ్జా
 బ్రెడ్, రమ్మలు, కిన్మిన్లు, పాబుడానా,
 మ్యాట్లు, రూ.500 లోపు ధర ఉన్న పాద
 రక్షలు, రూ.50 లక్షల లోపు బర్న్ వర్ ఉన్న

పన్ను పరిధిలోకి వచ్చేవి

రెస్టారెంట్లు, కిరోసిన్, బొగ్గు, రవాణా, రైళ్లు,
 విమానాలు, ట్యాక్సీ సేవలు(డి.ఎం. ఉబర్
 లాండ్రింగ్), గాలిమరలు, బయో గ్యాస్
 ప్లాంట్లు, వంట గ్యాస్, వంట నూనెలు, జిప్స
 థాలు, స్ట్రెంట్లు, స్టీలు పాత్రలు, ప్రాణాధార
 మందులు, సోయాబీన్, వేరుశనగ, నన్నె
 వర్ గింజలు, బేకర్ వస్త్రపులు, గృహోప
 యోగ వస్త్రపులు, సాన్లు, సూప్లు, ఎరు
 పులు, అగ్గిపెట్టెలు, సోలార్ వాటర్ హీటర్లు,
 పునరుత్పాదక ఇంధన పరికరాలు, బ్లడ్
 వాక్చిన్లు, ఇనుప స్టేబులు, ఎలక్ట్రీక్.




12%

విమాన
 రికెట్లు
 (రిజినెన్
 క్లాన్),
 నాన్-పెన్

హోటళ్లు, వర్క్ కాంట్రాక్టులు, నెయ్యి, ప్యాక్
 చేసిన డ్రై ఫ్రూట్స్, పండ్ల రసాలు, జామ్,
 జెల్లీ, పెస్టిళ్లు, పార్లనర్లు, పెన్లులు, సైకిళ్లు,

పన్ను పరిధిలోనివి

కాంటాక్ట్ లెన్స్, అట వస్త్రపులు, అయర్లెస్
 మందులు, టూత్ పేడర్, అగర్లెస్ట్లు,
 గొడుగులు, కుట్టు మిషన్లు, సెల్ ఫోన్లు,
 వెన్న, చీజ్, చామలు, కొవ్వొత్తులు, ఎలక్ట్రీక్
 లైట్లు, భుజియా, క్యాలెండర్లు, నీళ్ల
 పంపులు, ట్రాక్టర్లు, కుట్టుసూదులు, అల్ప
 మినియం పాత్రలు, వర్క్ కాంట్రాక్టులు,
 ప్రభుత్వ లాటరీలు.




18%

నూనెలు, మినరల్ వాటర్, ఐస్క్రీములు, పాస్తా, కార్బన్ షేట్స్, కేకులు, ఐస్క్రీమ్ ఫుడ్, నిల్వచేసిన కూరగాయలు, నూవలు, నాన్ డిన్లు, ఎర్లీజ్ స్టవ్లు, హెల్త్ ట్రై, ఎలక్ట్రానిక్ బొమ్మలు, స్ట్రీటు వస్తువులు, నోటు వున్నకాలు, మానిటర్లు, కెమెరాలు, స్పీకర్లు, రుమాల్లు, బ్రాకెట్ విడి భాగాలు, టిష్యూలు, ప్రింటెడ్ సర్క్యూట్లు, బ్రాండ్డ్ డుస్తులు, లిఫ్టర్ లైసెన్స్ ఉన్న ఏసీ వోటర్లు, టెలికాం సర్వీసులు, ఐటీ సర్వీసులు, ఫైనాన్స్ సర్వీసులు, ట్రేడ్ మార్క్, బీడీ ఆకులు, గుడిచిల్, సాఫ్ట్వేర్, బిస్కెట్లు, పేస్టీలు, స్ట్రీటు జంప్ట్రలు, ఐదుపు తూచే యంత్రాలు, ప్రింటర్లు, సీసీటీవీలు, అప్లికేట్ ఫైబర్, వెదురు ఫర్నిచర్, స్విమ్మింగ్ సూట్స్, సలాడ్ ప్రసంగులు, రూ. 500 దాదిన పాదరక్షలు, అల్ట్రావోల్ అమ్మే ఏసీ వోటర్లు, టెలికాం సర్వీసులు, ఐటీ సర్వీసులు, బ్రాండ్డ్ డుస్తులు, అర్థిక సేవలు. రూ. 25,00-7500 మధ్య అద్దె ఉండే వోటర్ గదులు, ఫైన్స్టార్ వోటర్లలోని రెస్టారెంట్లు.

పన్ను పరిధిలోకి వచ్చేవి

28%



బీడీలు, శీతల పానీయాలు, చూయింగ్ గమ్, మొలాసెన్, చాక్లెట్లు, చాక్లెట్ కోటెడ్ వేఫర్స్, పాన్ మసాలా, ఏరెటెడ్ వాటర్, పెయింట్లు, డియోడిరెంట్స్, పెర్ఫ్యూమ్లు, షేవింగ్ క్రిమ్స్, అప్టర్ షేప్, షాంపూలు, హెయిర్ డై, సన్ స్క్రీన్లు, వాల్ పేపర్లు, వాటర్ హీటర్లు, సిరామిక్ టైల్స్, డిష్ వాషర్, వేయింగ్ మిషన్లు, వాషింగ్ మిషన్లు, వెండింగ్ మిషన్లు, వాక్యూమ్ క్లీనర్లు, ఏర్ కండిషనర్లు, రిఫ్రిజరేటర్లు, ప్రింటర్లు, ఫ్యాక్స్ మిషన్లు, ఫర్నిచర్, షేవర్స్, హెయిర్ క్లిప్పర్స్, ఆటోమొటైల్స్, ఫైన్ స్టార్ వోటర్లు, రేస్ క్లబ్ టెక్స్ గులు, సినిమా టికెట్లు, మగర్ డ్రింకులు, కోకో, పొగాకు, దానికి ప్రత్యామ్నాయాలు, రాళ్లం, ఫ్లాస్టరింగ్ సామగ్రి, సిమెంటు, నల్లులు, కృత్రిమ వాక్స్, ప్లాస్టిక్ వస్తువులు, రబ్బరు, చెక్క వస్తువులు, కాగితం, బాయిలర్లు, యంత్రాలు, వడవలు, తేలే నిర్మాణాలు, ఫోటోగ్రఫీ, సినిమాటోగ్రఫీ వరికరాలు, వైద్య లేదా శస్త్ర చికిత్స వరికరాలు, వాచీలు, గోడ గడియారాలు, సంగీత వరికరాలు, వరువులు, కుషన్లు, డీపాలు, బొమ్మలు, గేమ్లు.

→ ఈ విధంగా జిఎస్టీ హక్కులను ఎంతో వస్త్రబు సేవలపై ఎంతోమంది ఎక్సైజ్ లాభాలను ఎంతోమంది జిఎస్టీలను.

→ మేములు, తృణానాగ్ల, మేల్లు, పెల్లం యిలు మేలె యిలని జిఎస్టీ నీయం ఎంతోమందిలను జిఎస్టీ.

గ్రా.పి.ఓ. వల్ల కలిగిన ప్రయోజనాలు:

9

జిఎస్టీఆర్ పోసాలకి అన్ని ఎక్కడైనా మేల చిరుగుతుంటుంది ఇన్వాయిస్ సహజ వ్యవస్థాపకంగా ఉండేన ఎస్.ఆర్ నారాయణ్ మూర్తి తెలుసుకోవడం జరిగింది. ఈ వమ్మ సోసేరం వల్ల పేదలకి ఎక్కువ ప్రయోజనం కలుగుతున్నాడు. జిఎస్టీ వల్లన మీన పో వృద్ధి అప్రమేయ చూపాలే 2% వరకు పెరిగిందాన్ని ఎవరినారు. ఈ జిఎస్టీఆర్ పోసా ఎవరికిగల 25 నూరు 30 కాలేం, అంతర్జాతీయ ఎవరికిగల 30 కాలేం వరకు పెరిగిందాన్ని తెలుసా. జిఎస్టీఆర్ కారణం జిఎస్టీ వృద్ధి లేదు అదనంగా నాలుగు కాలేం పెరిగి అదనం కేసుల ఉత్పాదన అమెరికా కేంద్ర బ్యాంక్ షాం రిజర్వ్ కొనుగో వేయడం జరిగిందాన్ని నారాయణ్ మూర్తి గారు ఎవరినారు జరిగింది.



→ నారాయణ్ మూర్తి

జిఎస్టీ వల్లన స్వల్పం ఏమి లేదాన్ని, జిఎస్టీ రాయడం వల్లన పేదలకి ఆ ప్రయోజనం చేరుతున్నాన్ని తెలుసుకోవడం నారాయణ్ మూర్తి గారు.

→ కర్మాగార అమీళ్లకి ఘాల్చిన పన్ను వ్యవస్థ జిఎస్టీ వల్ల రాష్ట్ర శిబిరాల్లో లాభిమే తొలి నష్టం ఉండడాని వారితోగ్గో పన్నుల అధికారాలం ఘోషించుట కేసీఆర్ కు వివాదాస్పదం జరిగింది. పెట్రోల్, ఎక్సైజ్ అలాంటివి జిఎస్టీ సూత్రం ముందుగా ఉన్నందున రాష్ట్రానికి 50% ఆదాయం వస్తోందన్న తెలియజేస్తారు. ఈ జిఎస్టీ వలన ఎక్సైజ్ మంత్రిగారి రాష్ట్రాలకు ఆదాయం సేవే కేంద్రీకృతం కావడాన్ని వివరించారు. ఈ జిఎస్టీ వలన అతనిగా 3 వేల కోట్ల నుంచి 3 వేల కోట్ల వరకు ఆదాయం వస్తోందన్నది, ఈ ఆ.క.గ. ఆ ధరలు తగ్గించడం వల్ల ఎక్సైజ్ వల్లన ఇబ్బందుల్లేవని పేర్కొన్నారు.



వారితోగ్గో పన్నుల అధికారాలం కేసీఆర్ కు జిఎస్టీ వల్లన కేంద్రీకృతం ప్రయోజనకరం, లాభాలు ఉంటాయి ముఖ్యంగా ఉన్నాయి సందర్భం.

→ జిఎస్టీ అమలు చార్జీగా నూతన ఉత్పత్తుల ధరలు తగ్గించడం వల్ల ఉంటుంది. 22-24 శాతం ఉన్న ఈ ఉత్పత్తి 18% తగ్గింది.



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→ గి.కె.ఆ. యంత్రం వల్లన అనేక రంగాలలో ఆదాయం పెరుగుతుంది. చిన్న చిన్న వ్యాపారులకు, నష్టం ఎక్కువయ్యే వారికి తెలియదు.

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ఇట్లు 80 మూత్రం గానం జరుగుతుంది.

డెబిట్ , డ్రాఫట్ కార్డు లావాదేవీలపై వడ్డీ భారం.

డెబిట్ , డ్రాఫట్ కార్డులపై వడ్డీ భారం అనుకుంటే
వాటిని చెప్పాలి. గతంలో 18%. ఉన్న వడ్డీ (వడ్డీలం 18%నికే
పెరిగడం జరిగింది.

→ అంటే కేరెండ్ 'BANKING' సేవల పై వడ్డీ భారం ఎక్కువ
మెట్రం వడ్డీలను చెల్లించడం. జిల్లాబంక్, నెట్ బ్యాంక్ నగదు
బిహెచ్ ఇన్స్ట్రుమెంట్ 3% అనుకుంటే ఉన్న చెల్లించడం జరుగుతు
ంది. కస్టమర్లు ఎలా 50 మూత్రం చెల్లించ వాటితో అనుకుంటే
150 రూపాయి చెల్లించడం విలువగా నేను వడ్డీ కేరెండ్ చెల్లించ
వాలి.

→ వికేట్ కేరెండ్ బండ్ల పై వడ్డీ భారం ఎక్కువ భారం వేయ
తుంది మేరం వాటిని బండ్లవల్ల అనుకుంటే 4.30 రూపాయి
యల వడ్డీలను విధించడం జరుగుతుంది. ఇలా చెబుతుంటే బ్యాంక్
కిలం మూత్రంలకు వివిధ రకాల వరు 360 రూపాయి కేట్. ఇన్స్ట్రుమెంట్
బండ్ల రూపాయి బండ్లను చెల్లించాల్సి వస్తుంది. ఈ వడ్డీల భారం
వాటిపై కేరెండ్ అనేక వడ్డీల పై అనేక అనుకుంటే
వాటిని బ్యాంక్ (వాటితో) ఎక్కువగా నేను కేరెండ్ అనుకుంటే
ఎలా చెబుతుంటే బ్యాంక్ ఇన్స్ట్రుమెంట్ వడ్డీల వేయతుంది.



మహిమ

→ బికె కేంద్రం, 29 అక్టోబర్, ఎటు కేంద్ర పాలిత పరిశ్రమల సహకార
 -ల సమాఖ్య ఎడనంట జరిగింది. బికె మేల ముఖ్యంగా అభివృద్ధిపాటు
 టి విజియూ" కక్రని ఇది చాలా చెప్పింది. జిఎస్టీ క్రొల్ ల్ అన్ని అక్షర
 ల సాక్షినిధుల మహిమలు, ఏ పాల్గొన్నారెనా, ప్రేమలక్ష్యం ఎదైనా క్రొల్
 ఉన్న వారంత "పేదల" గురించి ఆలోచించాలని మోటి ఎవరించారు.
 జిఎస్టీ ల్ "18" వర్గాలూ సహాయకమందించి, భగవద్దాతలనూ 18
 అక్షరాలూ ఉన్నాయని అన్నారు. "మనం ఆశించిన వర్తమా ఎంత దూర
 -ల ఉన్నా అక్షర అది అభివృద్ధి ఎంత దుర్లభమనా, సకల్ల ఉంటే
 దాని ఎదించవచ్చు" అని చాగర్లూ చెప్పడం బికిరింది జిఎస్టీ
 విజియూల చీని చెప్పినా మాని మోటి తెలుస్తారు. అంతే కాక
 గు.కె.కె. రూప నామ ఎంత సరిగ్గామి, రూపల్ గారల్ గారు
 తెలుసుకోవచ్చు గు.కె.కె. గుర్త సంగ్ దుక్ అని, తెలుసుకోవచ్చు.

MARKET SURVEY OF e-BIKES IN BHUPALAPALLY TOWN

Student Project submitted for
Bachelor of Commerce

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DEPARTMENT OF COMMERCE
GDC BHUPALPALLY, KAKATIYA UNIVERSITY-2018-19

PRINCIPAL
Govt. Degree College, Bhupalpally,
Dist: Jayashankar Bhupalpally-509100

INTRODUCTION

An electronic bicycle is first and foremost, a bicycle. It uses the same designs, geometries and components as any other bicycle, but also includes an added electric motor. This is fueled by a rechargeable battery, which gives riders an extra boost of power and ultimately provides a smoother, more convenient and less strenuous cycling experience. By eliminating many of the obstacles such as headwinds, steep hills, and bike commutes that leave riders tired, messy, and sweaty- electric bikes help make the freedom, exhilaration, and satisfaction of cycling available and accessible to a wide range of potential cyclists.

Electric bicycles are becoming increasingly popular throughout the world, as more and more people look for efficient, affordable, and eco friendly modes of transportation. Customer is believed as an important stockholder in business. Hence, consumer awareness is of importance to the business. The main objective of this study was to know about the people's awareness on electric bikes and the perception of the users about e bikes and to explore how the sale of e bikes can be increased.

What is an Electric Bike?

Electric bikes work on the electricity basis. Electric bike has a battery inside which needs to be charged to run an electric motor. Since it uses electricity, it does not release any harmful gases into the environment. And electric bikes are considered the safest mode of transportation because they do not emit carbon and harmful gases. Which helps in reducing the environmental pollution?

NO PETROL COST

Electric bikes run on electricity. They do not need any petrol. So the cost of running e bikes is lower.

EASY MAINTENANCE

Maintenance of e bikes is as easy as the parts of e bikes can be replaced easily and it runs on electricity alone. So that can be charged anywhere whereas it is based on plug and charging system.

ECO-FRIENDLY

Electric bike does not produce any harmful gases into the environment as it runs on electricity only. So it is ecofriendly mode of transport. It does not create any air and noisepollution as well.

Petrol bikes produce harmful gases into the environment. And they are causing air and noise pollution which are major drawbacks of petrol bikes. In terms of price, electric bikes are more expensive than petrol bike that would be a heavy burden on the middle class. The battery used in an electric bike is very expensive so the cost of electric bikes is high.

The data collected for the study was based n primary data as well as secondary data. The sample size selected for the survey was 10. The primary data collected through questionnaire and personal interview. Graphical presentation was used to analyze and interpret the data to obtain conclusion.

STATEMENT OF THE PROBLEM

Day to day in urban areas air pollution is increasing and electric bikes are in great demand as there is scarcity in fuels. But it is not used by most of the people because of lack of awareness. Thus the purpose of the study is to study the awareness level of consumers towards e bikes and the perception of the users.

THE OBJECTIVES OF THE STUDY ARE:

- To find out the awareness of consumer about the electric bikes in bhupalpally town.
- To know the reason why consumer prefers to electric bike
- To know the users perception about electric

SAMPLING SIZE: 50 users of two wheelers in bhupalpally town

SAMPLING METHOD: non probability

SAMPLING TECHNIQUE: convenience **sampling**

MAJOR FINDINGS

- It was found that most of the customers are not much satisfied with the price of the product, and price quoted by the companies has affected the customer satisfaction to a great deal.
- Most of the customers were satisfied with the mileage of the electric bikes and are convinced about the electric bike benefits and were willing to refer it to their friends.
- It was found that most of the respondents feel that the factors such as speed and battery life and appearance of electric bikes are the main reasons

MAJOR SUGGESTIONS

- There are few advertisements in newspapers and TVs.
- The price of the electric bikes needs to be decreased.
- As most of the people prefer high speed



**Principal
Government Degree College
Bhupalpally**

GOVERNMENT DEGREE COLLEGE, BHUPALPALLY
JAYASHANKAR DISTRICT - 506169



DEPARTMENT OF CHEMISTRY
STUDENT STUDY PROJECT

2018-19

TITLE : ELECTRONIC SPECTROSCOPY

Certified that this is a bonafide work done by the following B.Sc I year students of this college in the subject of chemistry

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ELECTRONIC SPECTROSCOPY (OR)

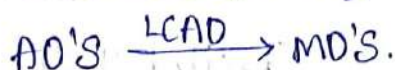
UV-VISIBLE SPECTROSCOPY

UV-Spectroscopy is the study of electronic transitions or rearrangement in the molecule produced from irradiation with UV-visible light.

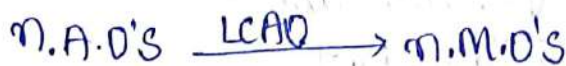
● UV-Visible radiation brings about changes in electronic levels of molecules, also referred as electronic spectroscopy, mainly valence electrons are involved in transitions.

BONDING, ANTIBONDING MOLECULAR ORBITALS :-

⇒ Linear combination of Atomic orbitals [LCAO] produces molecular orbitals. (M.O's)

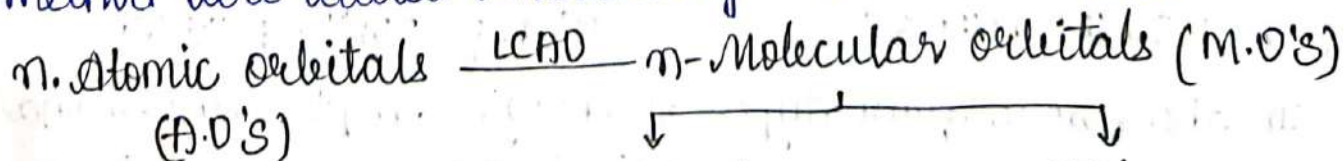


⇒ Number of molecular orbitals produced are equal to no. of atomic orbitals mixed.

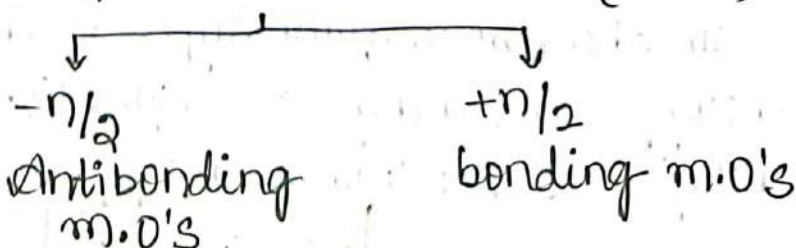


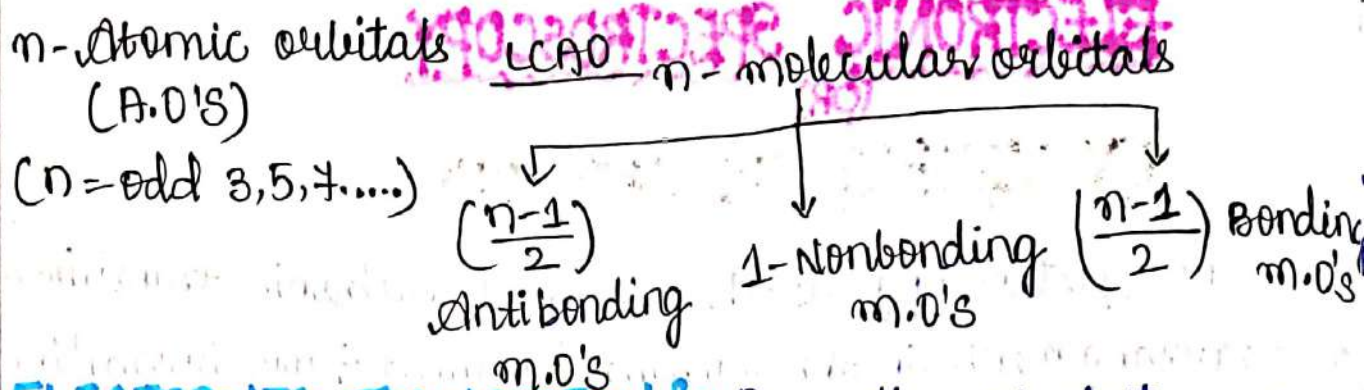
⇒ Half of the molecular orbitals possess low energy than Atomic orbitals and produced by addition method are called Bonding molecular orbitals.

⇒ Half of the molecular orbitals possess high energy than the Atomic orbitals and produced by the subtraction method are called Antibonding molecular orbitals.

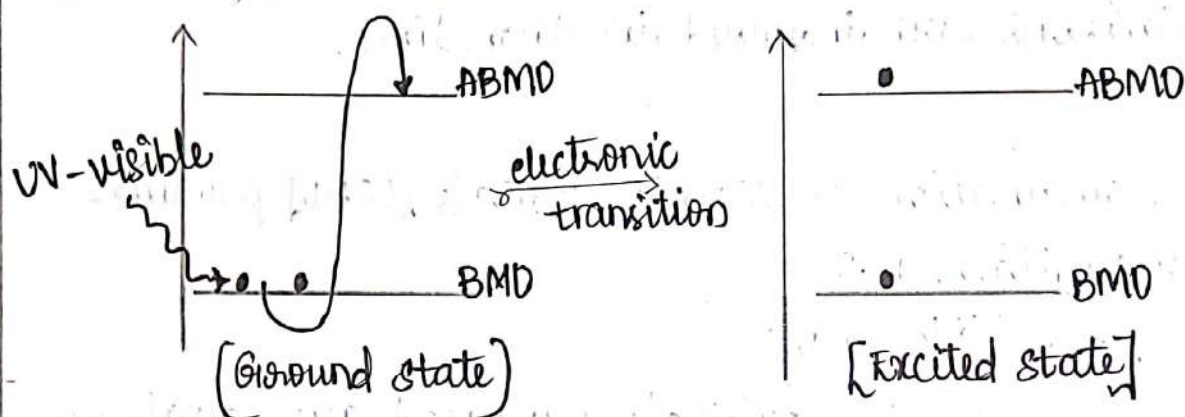


($n = \text{even} - 2, 4, 6, \dots$)





ELECTRONIC TRANSITION :- Promotion of electron from lower energy m.o. to higher energy m.o. by interacting with radiation is called electronic transition.



The Range of UV-Visible radiation is 200-800 nm.

$\lambda = 200-400 \text{ nm}$ - UV-radiation

$400-800 \text{ nm}$ - visible light.

ENERGY LEVELS OF MOLECULES :- Generally molecules possess 4 types of energy levels. In molecules certain quantity of energy is stored internally, this energy is called Internal energy. It is associated with the following 4 types of energies.

1) TRANSLATIONAL ENERGY

2) VIBRATION FREQUENCY/ENERGY

3) ROTATIONAL ENERGY

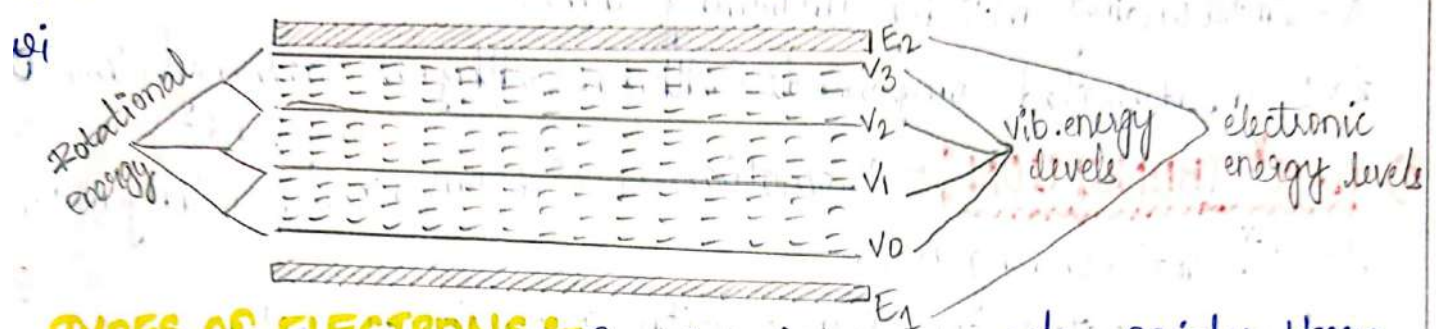
4) ELECTRONIC ENERGY

In the above four types of energies except translational energy remaining are quantised. The order of various energies is Electronic energy > Vib. energy > Rotation energy

$$E_e > E_v > E_r$$

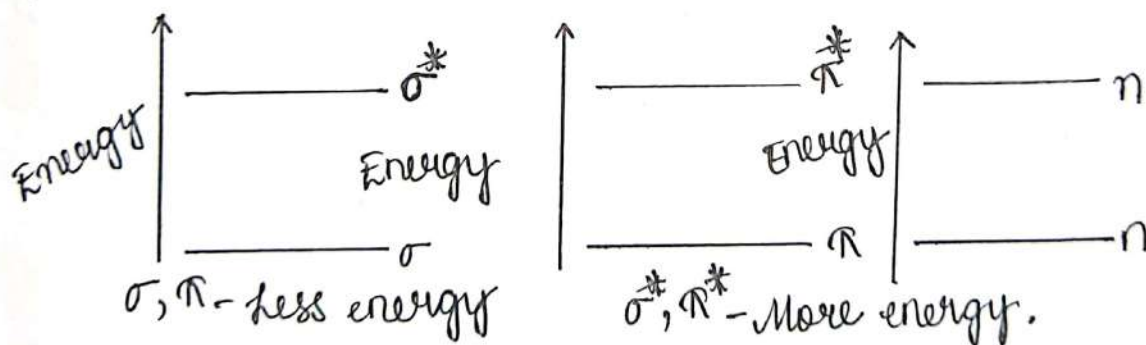
In between every two electronic energy levels, a number of vib. energy levels are present similarly in between every two vib. energy levels, a number of rotational energy levels are present.

When electronic transition occurs that can lead to change in vib. and rotational energy levels of the molecules.



TYPES OF ELECTRONS: In organic compounds mainly there are three types of electron (bonds)

- (1) σ -bonded electrons - Ex: All org-molecules.
- (2) π -bonded electrons - Ex: Unsaturated compound.
- (3) non-bonded electrons - Ex: Compound with lone pair of electrons.



TYPES OF ELECTRONIC TRANSITIONS: Based on nature of the electrons there are total six types of electronic transitions are possible in org. compounds, they are

- 1) $\sigma \rightarrow \sigma^*$ Transition
- 2) $\pi \rightarrow \sigma^*$ Transition
- 3) $\sigma \rightarrow \pi^*$ Transition
- 4) $n \rightarrow \sigma^*$ Transition
- 5) $\pi \rightarrow \pi^*$ Transition
- 6) $n \rightarrow \pi^*$ Transition

Although six transitions are possible but in reality only two types of transition ($\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$) are detectable, remaining are ruled out because they occur in out of

range of radiation. ($< 200\text{nm}$ (or) 400nm)

1) $\sigma \rightarrow \sigma^*$ TRANSITION:- Promotion of electron from σ -bonding M.O to σ^* anti-bonding M.O in the absorption of UV light.

Ex:- Alkanes [CH_3-CH_3], Cycloalkanes, All orgo-compounds.

2) $\pi \rightarrow \pi^*$ TRANSITION:- Promotion of e^- from π -bonding M.O to π^* Antibonding M.O by absorbing light.

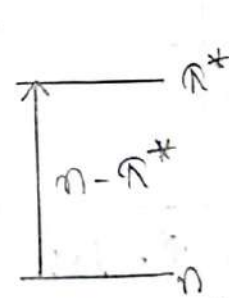
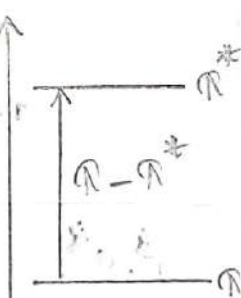
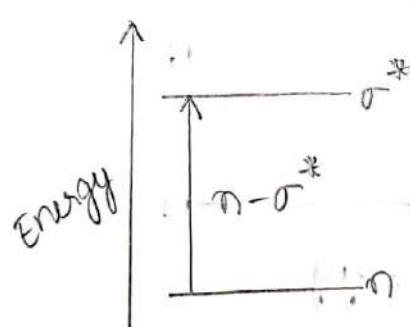
Ex:- Unsaturated compounds (Alkenes, Alkynes, Carbonyl etc., compounds)

3) $n \rightarrow \pi^*$ TRANSITION:- Promotion of e^- from Non-bonding M. to π^* Anti-bonding M.O.

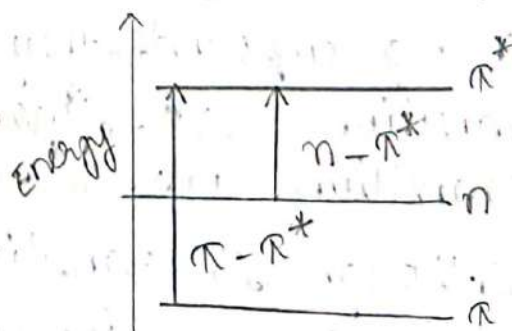
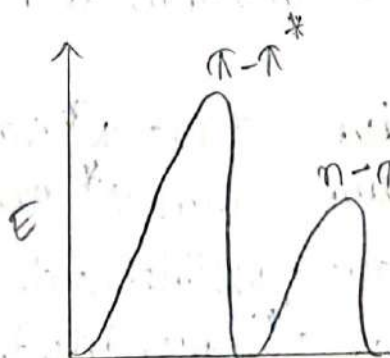
Ex:- Unsaturated compounds with lone pair of electrons [Carbonyl compounds]

4) $n \rightarrow \sigma^*$ TRANSITION:- promotion of e^- from Nonbonding M. to σ^* Antibonding M.O.

Ex:- Saturated comp. with lone pair of e^- s (Alcohols, Amines)

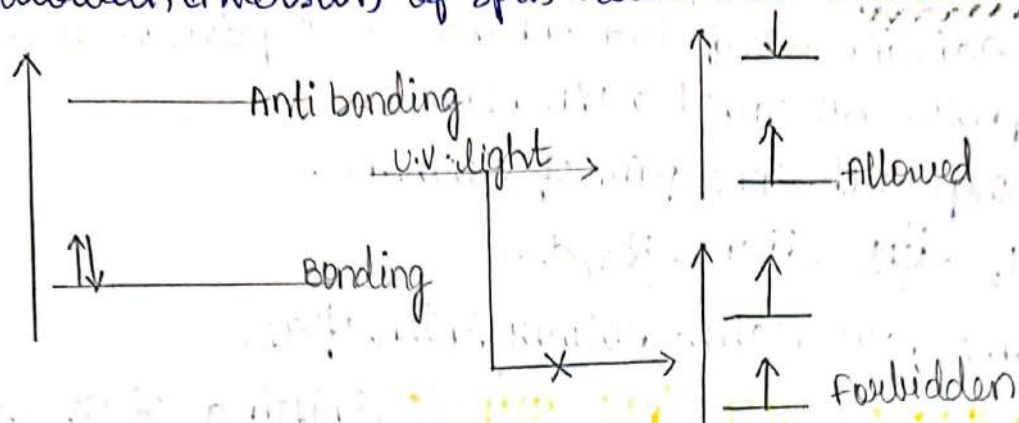


Electron transitions in carbonyl compounds

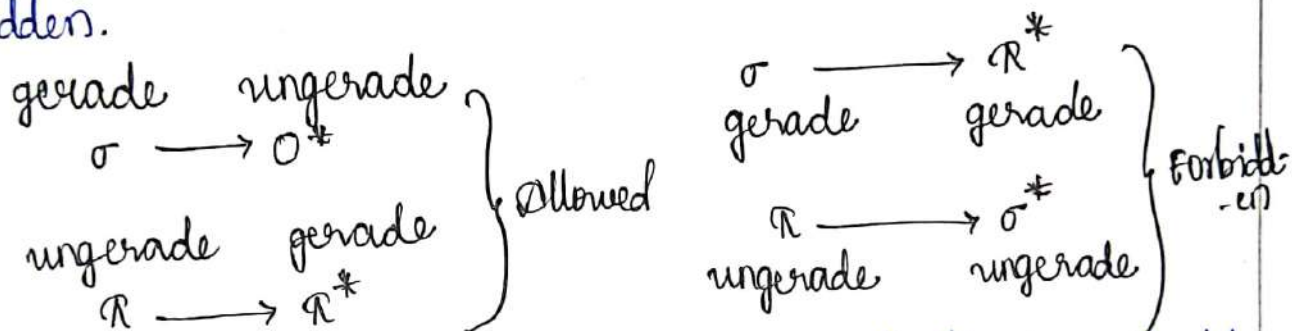


SELECTION RULES :-

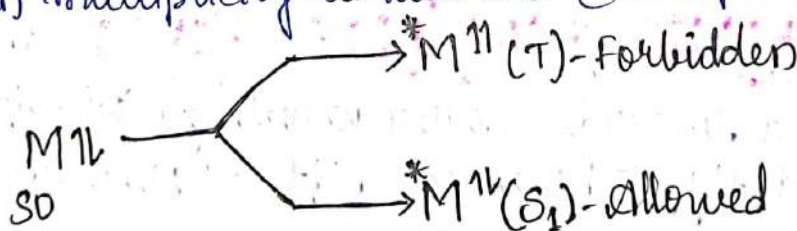
1. During the electronic transitions Retention of spin of electron is allowed, Inversion of spin electron is Forbidden.



2. In electronic Transitions, involved orbitals with different symmetry are allowed and orbitals with same symmetry are forbidden.



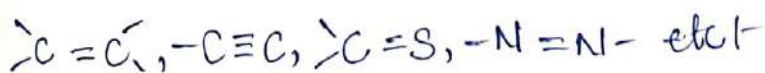
3. In electronic transition change in multiplicity is forbidden, Retention in multiplicity is allowed (multiplicity exclusion principle)



TERMINOLOGY :-

(1) CHROMOPHERE :- The group which is responsible for absorption of UV-Visible range of radiation is called chromophore. These groups impart colour to the molecules.

Ex:- All unsaturated groups are chromophores.



Nitro ($-\text{NO}_2$) group imparts yellow colour to the compound.
 Azo ($-\text{N}=\text{N}-$) group imparts colours to the compounds.

(2) AUXO CHROME :- Groups which cannot absorb UV-visible range of radiation itself, but enhances absorption wavelength of chromophores are called auxochromes.

Ex:- Group with lone pair of electrons.

$-\ddot{\text{O}}\text{H}$, $-\ddot{\text{O}}\text{CH}_3$, $-\ddot{\text{N}}\text{H}_2$, $-\ddot{\text{N}}\text{HR}$, $-\ddot{\text{X}}:$ etc.....

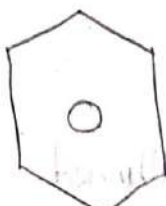
Auxo chromes are called colour intensifiers.

(3) BATHOCHROMIC SHIFT/RED SHIFT :- Shifting of UV-visible band towards longer wave lengths (or) right side in a spectrum is called bathochromic shift (or) Red shift.



benzene

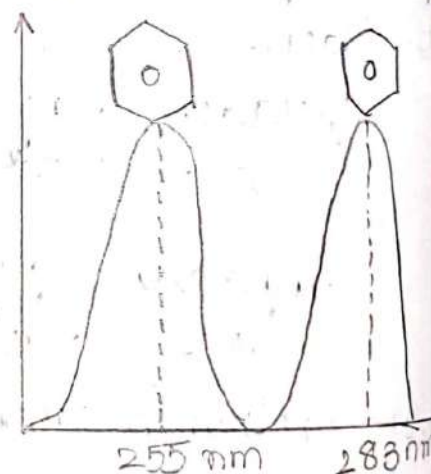
$\lambda_{\text{max}} = 255 \text{ nm}$



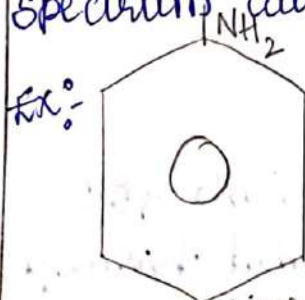
phenol

$\lambda_{\text{max}} = 283 \text{ nm}$

Bathochromic shift \rightarrow

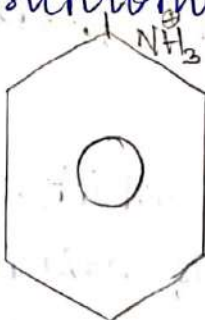


(4) HYPSOCHROMIC SHIFT/BLUE SHIFT :- Shifting of UV-visible band towards shorter wavelength (or) left side in a spectrum called Hypsochromic shift (or) blue shift.



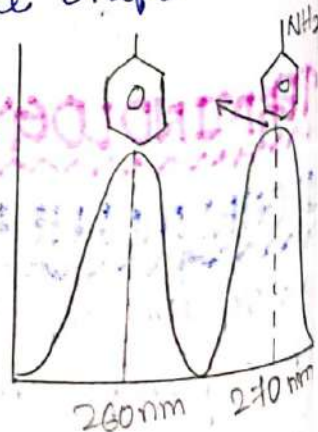
aniline

$\lambda_{\text{max}} = 270 \text{ nm}$



$\lambda_{\text{max}} = 260 \text{ nm}$

Hypsochromic shift \rightarrow



ABSORPTION WAVELENGTH (λ_{max}) OF VARIOUS CHROMOPHORES

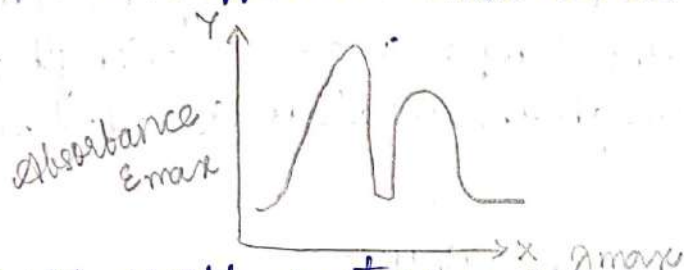
COMPOUNDS

λ_{max}

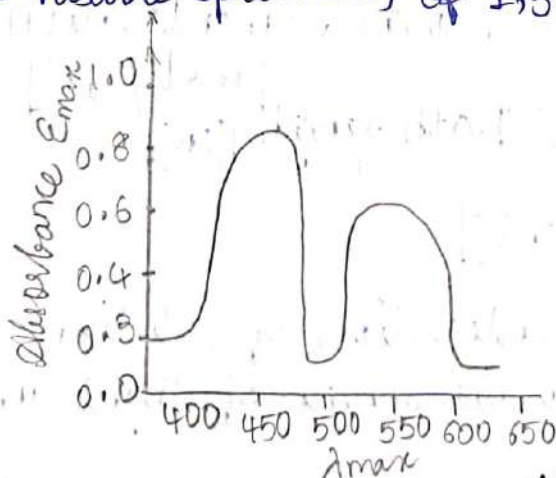
1. Ethylene $CH_2=CH_2$	193 nm
2. 1,3-butadiene $H_2C=CH-CH=CH_2$	217 nm
3. 2,3-dimethyl butadiene $H_2C=C(CH_3)-C(CH_3)=CH_2$	226 nm
4. α,β -unsat ketone (enone)	215 nm
5. Aromatic chromophore	246 nm

REPRESENTATION OF UV-VISIBLE SPECTRA :-

UV-Visible spectra is a plot of molar extinction coefficient vs Absorption wavelength (λ_{max}). The spectrum contains $[E_{max}]$ bands at different λ_{max} values.



Ex:- UV. visible spectrum of 1,3 Butadiene.



General features of absorption spectroscopy :-
(Electronic spectroscopy)

1. TRANSMITTANCE (T): - The ratio of intensity of transmitted light (I_t) to the intensity of incident light (I_0) is called transmittance

$$T = \frac{I_t}{I_0}$$

It is measured as % Transmittance (%T)

$$\%T = \frac{I_t}{I_0} \times 100$$

% T can have any value from 0. 100% T means no absorption by the compound.

2. ABSORBANCE (A): - The logarithm to the base 10 of the reciprocal of the transmittance is called Absorbance.

$$A = \log_{10} \left(\frac{1}{T} \right) \text{ or } A = -\log_{10} T$$

Absorbance is the measure of the capacity of a substance to absorb light of a specific wavelength.

MOLAR ABSORPTIVITY (ϵ): - The proportionality constant which relates the absorbance (A) at particular wavelength (λ) to the molar concentration (C) of the sample and the pathlength (l) of the light beam passing through the medium, is called molar absorptivity.

$$A \propto C$$

$$A = \epsilon c l$$

$$\epsilon = \frac{A}{C \times l}$$

A \longrightarrow Absorbance

C \longrightarrow Molar concentration

l \longrightarrow Path length $\left[\frac{\text{mols}}{\text{lit}} \right]$
[cm]

$$\text{units of } \epsilon = \text{lit-mole}^{-1}\text{-cm}^{-1}$$

ϵ - value depends on concentration of solution and path length, but independent on wave length of light and nature of the medium.

BEER - LAMBERT'S LAW: -

BEER'S LAW :- (Absorbance vs concentration)

'When a monochromatic light is passed through a solution, the decrease in the intensity of light is directly proportional to concentration of the solution.'

$$\Rightarrow -\frac{dI}{I} \propto dc$$

$$\Rightarrow -\frac{dI}{dc} \propto dI$$

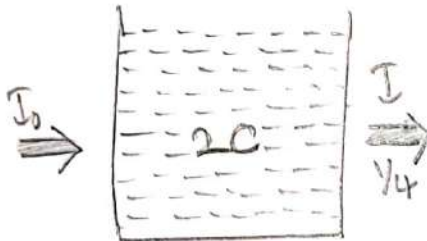
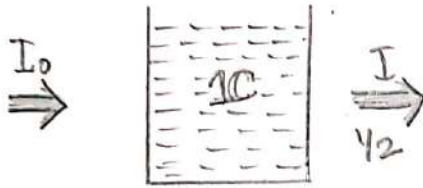
$$\Rightarrow \frac{dI}{dc} = KI$$

$dI \rightarrow$ change in intensity

$dc \rightarrow$ change in concentration of solution.

After integration $I = I_0 \cdot e^{-Kc}$

[Dependence of absorbance on the concentration]



[Dependence of Absorbance on the concentration]

[path length / thickness of solution is same]

LAMBERT'S LAW :- (Absorbance vs path length)

'When a monochromatic light is passed through a solution, the decrease in the intensity of radiation is

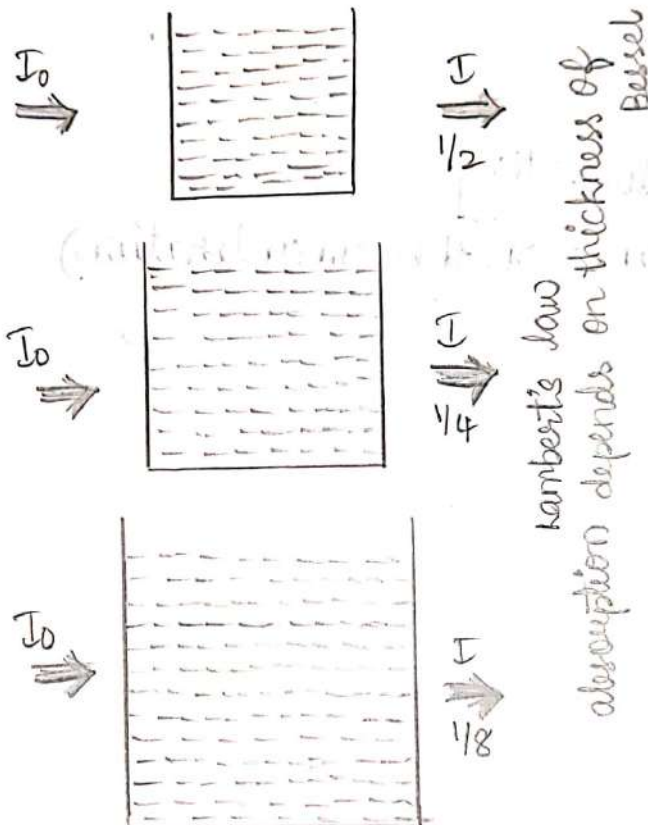
directly proportional to thickness (pathlength) of the solution

$$\Rightarrow -\frac{dI}{I} \propto dt$$

$$\Rightarrow -\frac{dI}{dt} \propto I$$

$$\Rightarrow -\frac{dI}{I} = k dt$$

After integration $I = I_0 \cdot e^{-kt}$



[Dependence of absorbance on thickness of medium]

BEER-LAMBERT'S LAW:-

From Beer's law $I = I_0 \cdot C^{-KC}$ ——— ①

From Lambert's law $I = I_0 \cdot e^{-Kt}$ ——— ②

From (1) & (2) Beer-Lambert's law $I = I_0 \cdot e^{-Kct}$

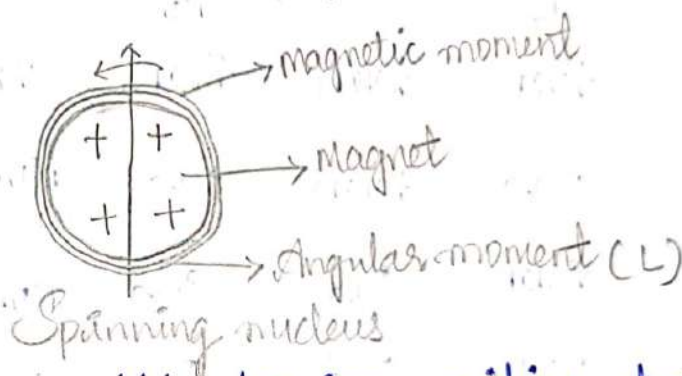
"The intensity of incident light passed through a solution depends on concentration of solution and thickness of the medium."

LIMITATIONS:- This law is applicable, only,

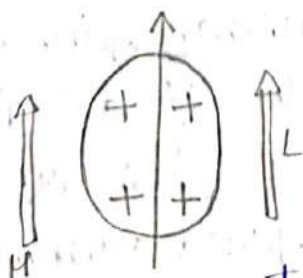
1. When plot a graph between absorbance 'A' and concentration 'c' gives straight line passing through the origin.
2. Using monochromatic light.
3. Solution contain a group which absorb a definite wave length of light.

PROTON MAGNETIC RESONANCE SPECTROSCOPY.

NATURE OF NUCLEUS:-



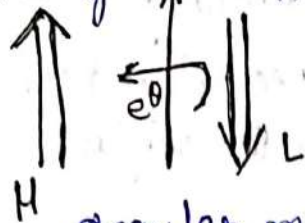
- ⇒ Nucleus is a tiny particle having positive charge.
- ⇒ Like electron, nucleus also rotates around its own axis and produce magnetic field. Therefore, nucleus acts as a tiny bar magnet.
- ⇒ Rotation of particle around its own axis called spinning.
- ⇒ Spinning nucleus associates with magnetic moment vector (μ) and Angular momentum vector (L) Both are parallel to each other.



Angular momentum $L/P = \sqrt{I(I+1)} \cdot \frac{h}{2\pi}$

I = sum of spin quantum members.

For spinning electron, H -vector and L -vector directions are opposite.



Angular momentum $4p = \sqrt{I(I+1)} \cdot \frac{h}{2\pi}$.

I = spin quantum numbers of nucleus.

h = plank's constant.

\Rightarrow If spin quantum number is zero \rightarrow nucleus is non-magnetic.

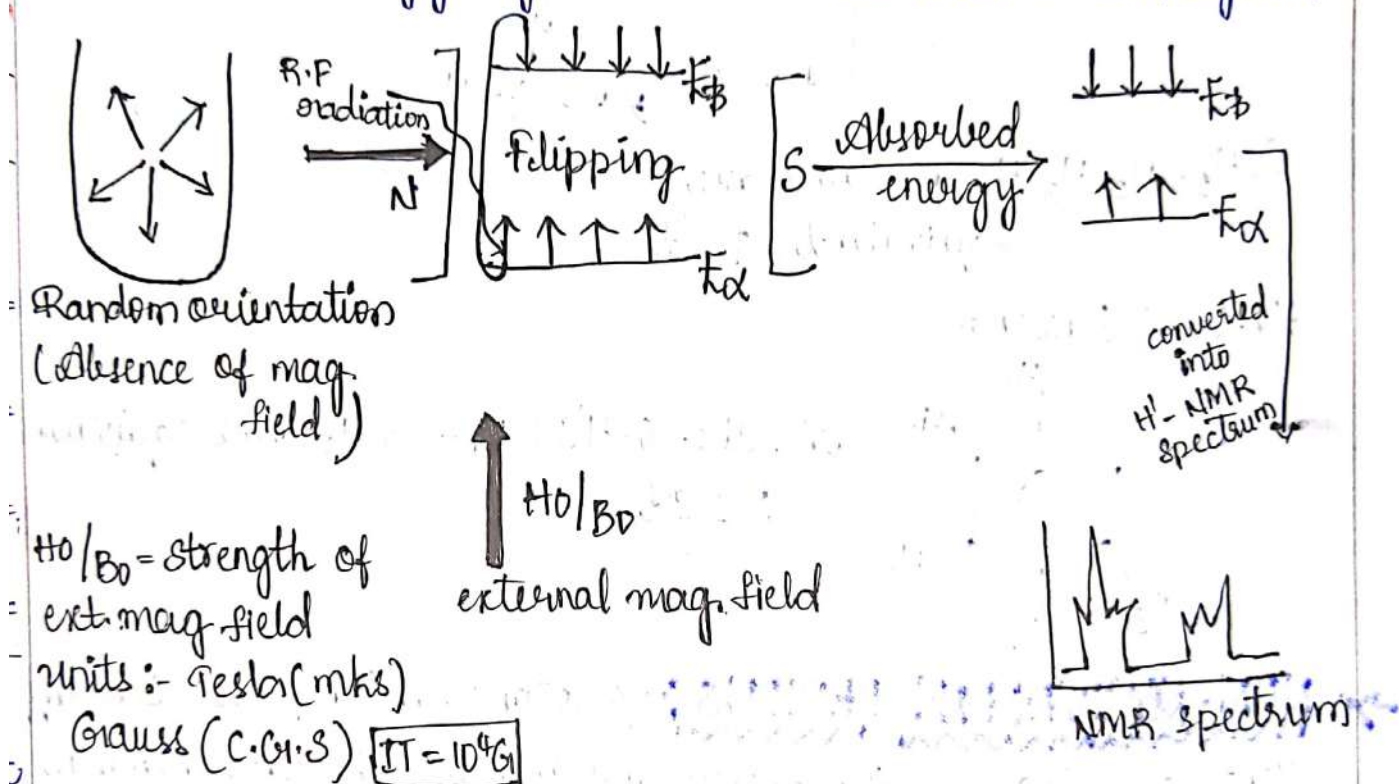
S.NO	NO. of p's	NO. of n's	At. NO	Mat. NO.	Spin Q. NO [1]	Example
1.	Even	Even	Even	Even	Zero	${}^6C^{12}, {}^{16}S^{22}, {}^8O^{16}$
2.	Even	Odd	Even	Odd	Non integer ($\frac{1}{2}, \frac{3}{2}, \dots$)	${}^6C^{13} (I=\frac{1}{2}), {}^8O^{17} (I=\frac{1}{2})$
3.	Odd	Even	Odd	Odd	Non-integer	${}^{15}N (I=\frac{1}{2}), {}^9F^{19} (I=\frac{1}{2})$
4.	Odd	Zero	Odd	Odd	Non-integer	${}^{15}P^{31} (I=\frac{1}{2}), {}^1H (I=\frac{1}{2})$
5.	Odd	Odd	Odd	Even	Integer [1, 2, 3, ...]	${}^{14}N (I=1), {}^2D (I=2)$

PRINCIPLE:- In the absence of external magnetic field, spin orientation of nuclei are random. Once magnetic field is applied at the nuclei disorder / random arrangement of nuclei disappears and nuclei orients in two possible directions.

In one orientation nuclear spins are parallel to direction of external magnetic field (Aligned orientation). In another orientation nuclear spins are \perp to direction of external magnetic field (Opposed orientation H_{\perp}). Little excess of nuclei with aligned arrangement, then opposed.

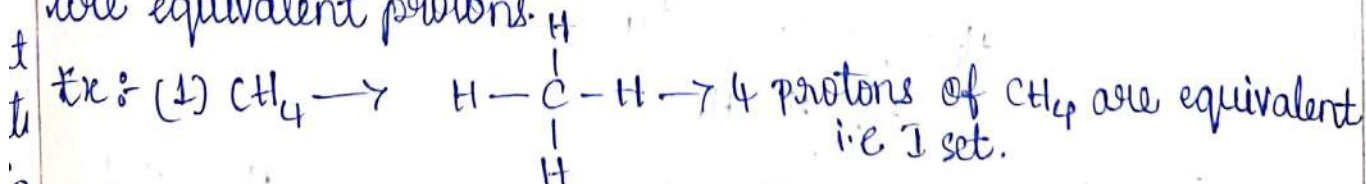
Under resonance condition, if nuclei irradiated with Radio frequency (RF) radiation nuclei absorbs energy and participate in upward transitions with change in spin orientations are called flipping of nuclei.

RESONANCE:- Matching of energy of R.F radiation and energy gap of two nuclear energy levels is called Resonance. The absorbed energy by nuclei converted into H^1 -NMR signal.

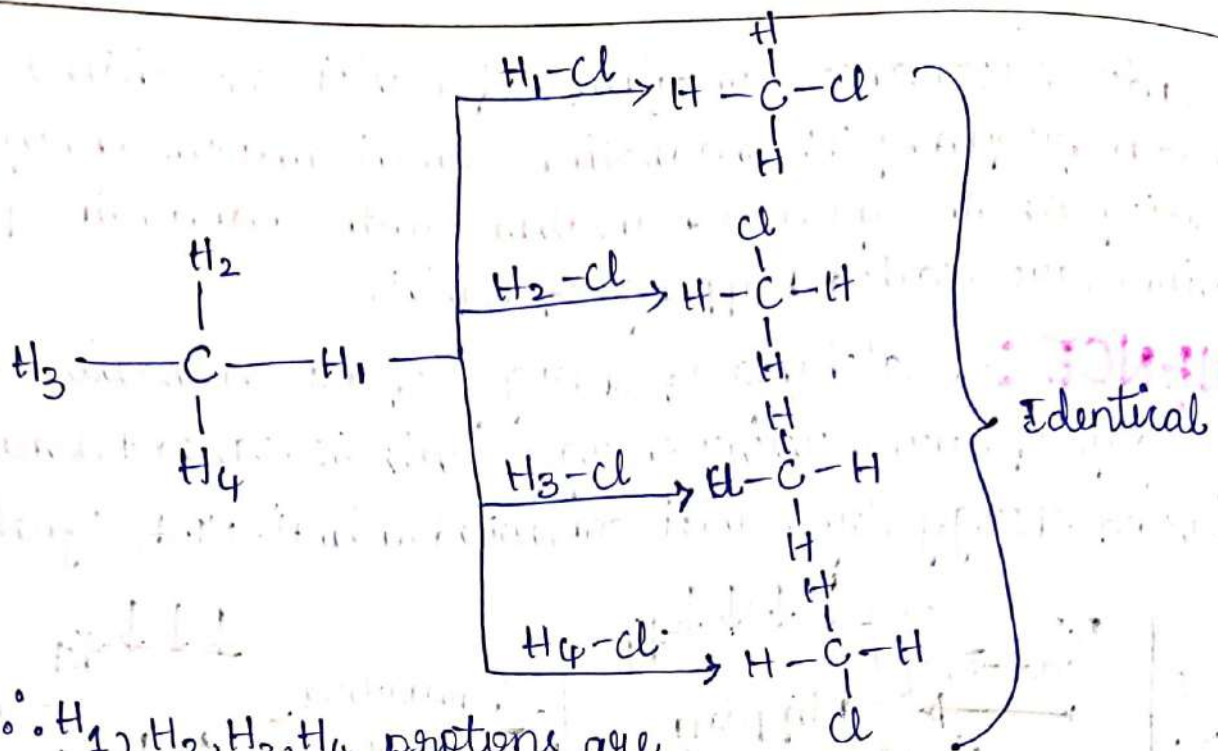


EQUIVALENT AND NON-EQUIVALENT PROTONS:-

EQUIVALENT PROTONS:- protons which possesses same chemical environments and similar chemical shift (δ) values are equivalent protons.

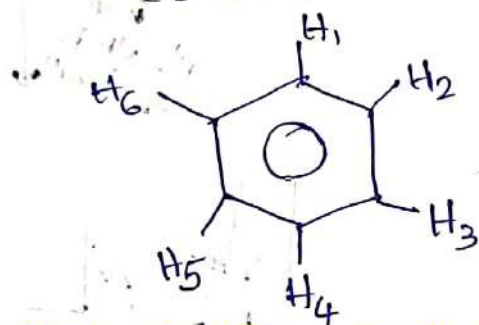


Substitutions of selected proton with third different group if produces same product, then those protons are equivalent, otherwise they are non-equivalent. (Substitution criterion)



∴ $\text{H}_1, \text{H}_2, \text{H}_3, \text{H}_4$ protons are equivalent = 1 set

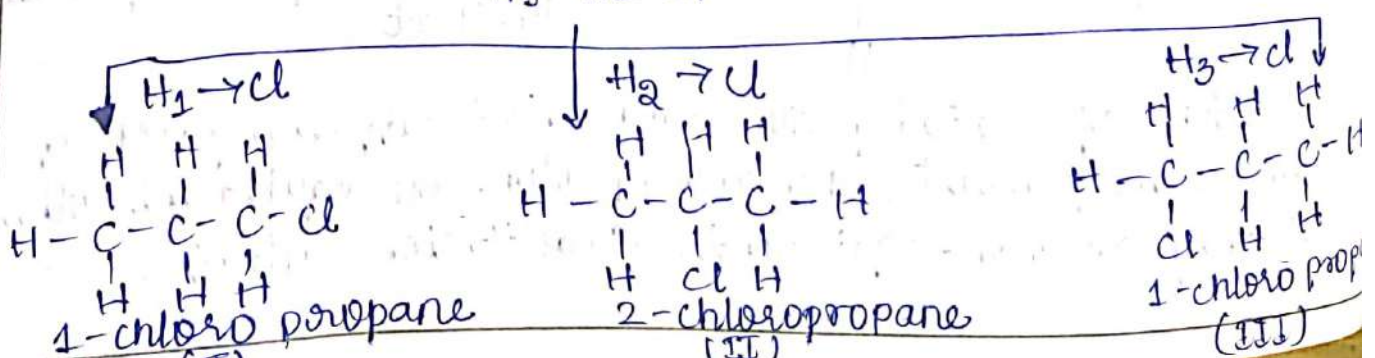
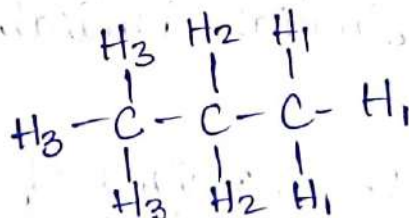
Ex: - (2) Benzene.



All the 6-H's ($\text{H}_1 \rightarrow \text{H}_6$) are equivalent
∴ 1 set.

→ **NON-EQUIVALENT PROTONS**:- protons which possess different chemical environments and show different chemical shift (δ) values are called non-equivalent protons.

Ex:- $\text{CH}_3 - \text{CH}_2 - \text{CH}_3$ - propane

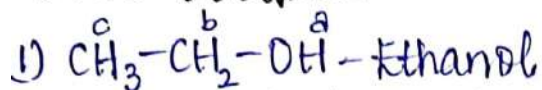


I, II are identical \rightarrow equivalent

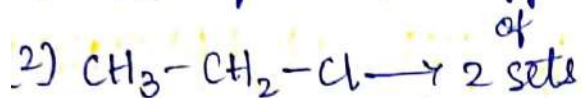
III \rightarrow Different from I & II

\therefore Two types of protons = 2 sets

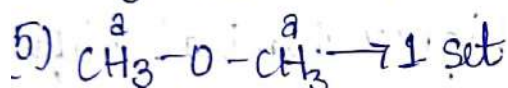
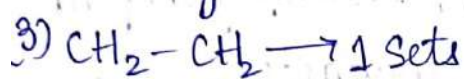
Other examples :-



3-Non-equivalent sets, protons.



Ethyl chloride.

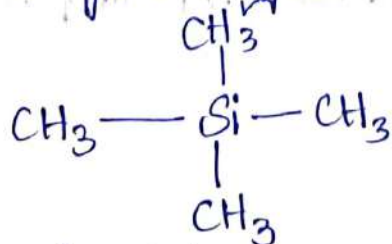


CHEMICAL SHIFT $[\delta]$ / POSITION OF NMR-SIGNAL :-

The change in the position of nmr signal when compared with reference compound due to shielding (or) deshielding effect of protons is called chemical shift (δ).

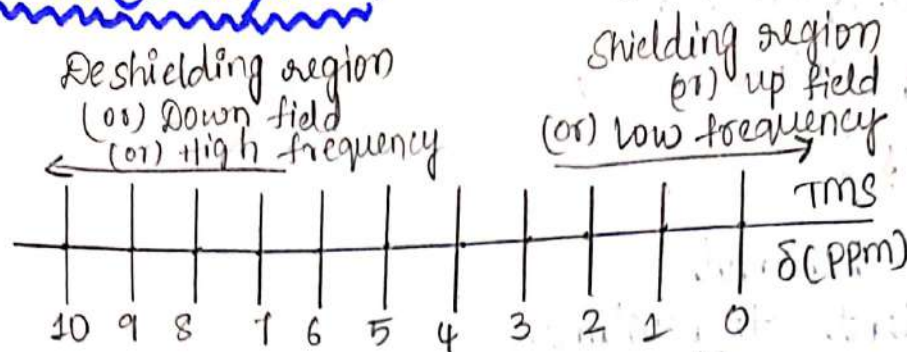
$$\text{Chemical shift } (\delta) = \frac{V_{\text{sample}} (\text{Hz}) - V_{\text{reference}} (\text{Hz})}{V_{\text{instrument}} (\text{MHz})}$$

The reference compound used in NMR spectroscopy is TMS [Tetramethyl silane] its chemical shift (δ) is zero.



\Rightarrow chemical shift of equivalent protons is always same.
 \Rightarrow chemical shift of non-equivalent protons is always different.

⇒ δ-SCALE (0-10) PPM :-

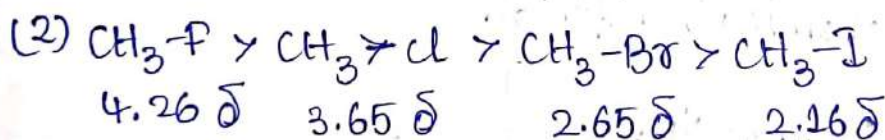
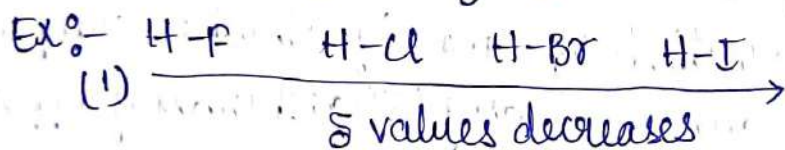
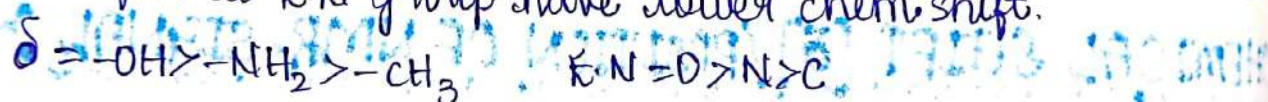


⇒ FACTORS AFFECTING CHEMICAL SHIFT OF PROTONS

1. ELECTRONEGATIVITY (E.N) :- As the E.N of group increases, δ-chemical shift of protons also increases.

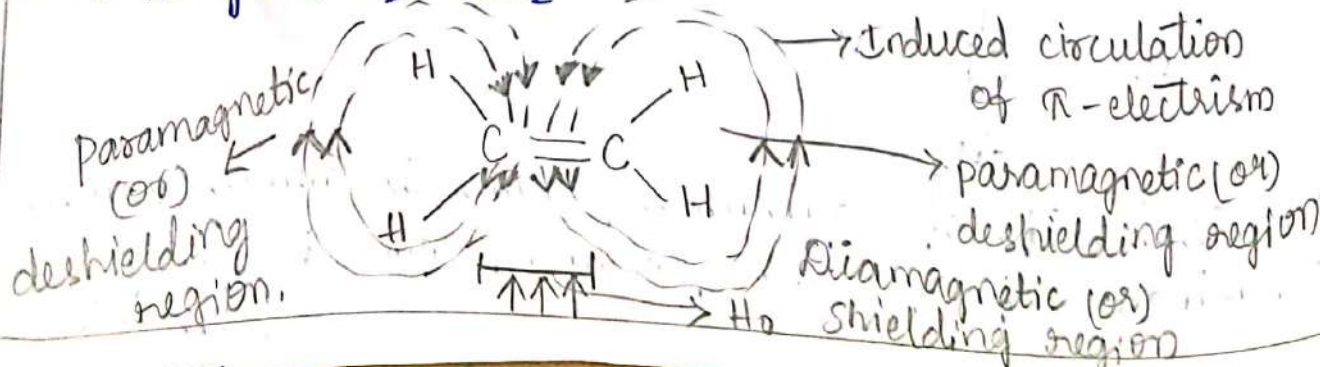
$$\text{chem. shift} \propto \text{E.N}$$


Proton nearer to E.N group have higher chemical shift and far to E.N group have lower chem. shift.



2. ANISOTROPIC EFFECT :- Any internal effect produced the molecule distributes non-uniformly is called Anisotropic effect.

→ This is mainly observed in unsaturated compounds.





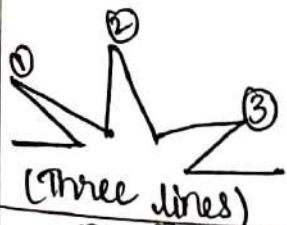
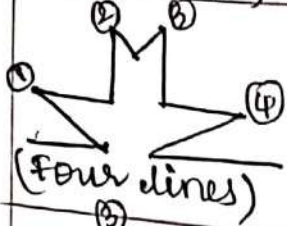
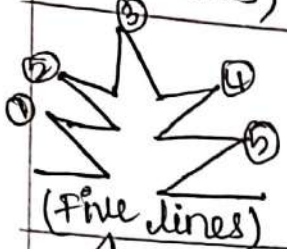

TYPE OF PROTON	CHEMICAL SHIFT ^(δ)
$R-\underline{CH}_3$	0.7 - 1.3
$R-\underline{CH}_2-R$	1.2 - 1.4
R_3CH	1.4 - 1.7
$R-\overset{\cdot}{C}=\overset{\cdot}{C}-\underline{H}$ (Alkene proton)	4.5 - 6.5
$R-C\equiv C-\underline{H}$ (Alkyne proton)	1.7 - 2.7
 -H (Aromatic proton)	6.5 - 8.0
$R-\overset{\parallel}{O}-\underline{H}$ (Aldehyde proton)	9.0 - 10
$R-COO\underline{H}$ (Acid proton)	2.0 - 2.5
$H-C-OH$	1 - 5.5

SPLITTING OF NMR SIGNAL :- Interaction of spin of one particular set of protons with the spin of non-equivalent neighbouring protons in the same molecule leads to splitting of nmr-signal.

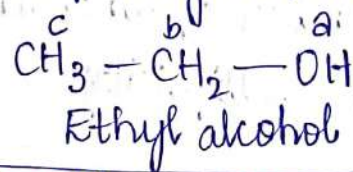
⇒ Splitting of nmr-signal is due to spin-spin coupling process.

SPIN MULTIPLICITY :- Total number of lines in a nmr signal is called multiplicity/spin multiplicity.

<u>NMR-SIGNAL</u>	<u>NAME</u>	<u>SYMBOL</u>	<u>SPIN-MULTIPLICITY</u>
 (one line)	singlet	s	1
 (two lines)	Doublet	d	2

 (Three lines)	Triplet	t	3
 (Four lines)	Quartet	q	4
 (Five lines)	Pentet	p	5
 (more than five lines)	Multiplet	m	>5

⇒ **SPIN-SPIN COUPLING** :- The process of spin orientation of one particular set of protons coupled with the spin orientation of neighbouring protons is called spin-spin coupling.



Spin multiplicity of proton-n

n = no. of neighbouring protons
 In above example ethyl alcohol

⇒ for $-\text{OH}$ protons \Rightarrow no. of neighbouring proton (n) = 2 ($-\text{CH}_2$)
 \therefore multiplicity of $-\text{OH}$ protons = $n + 1 \Rightarrow 2 + 1 \Rightarrow 3$

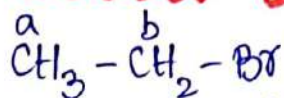
⇒ for $-\text{CH}_2$ protons \Rightarrow no. of neighbouring protons (n) = 4
 $-\text{CH}_3(-\text{OH})$

⇒
 triplet

∴ multiplicity of $-CH_2^b$ proton $= n+1 = 4+1 = 5$

1H -NMR SPECTRAS OF SOME ORG. COMPOUNDS:-

1) ETHYL BROMIDE:-



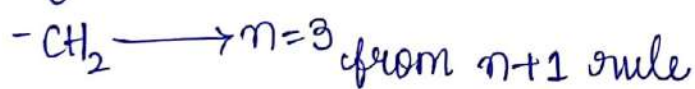
2- sets of proton a & b



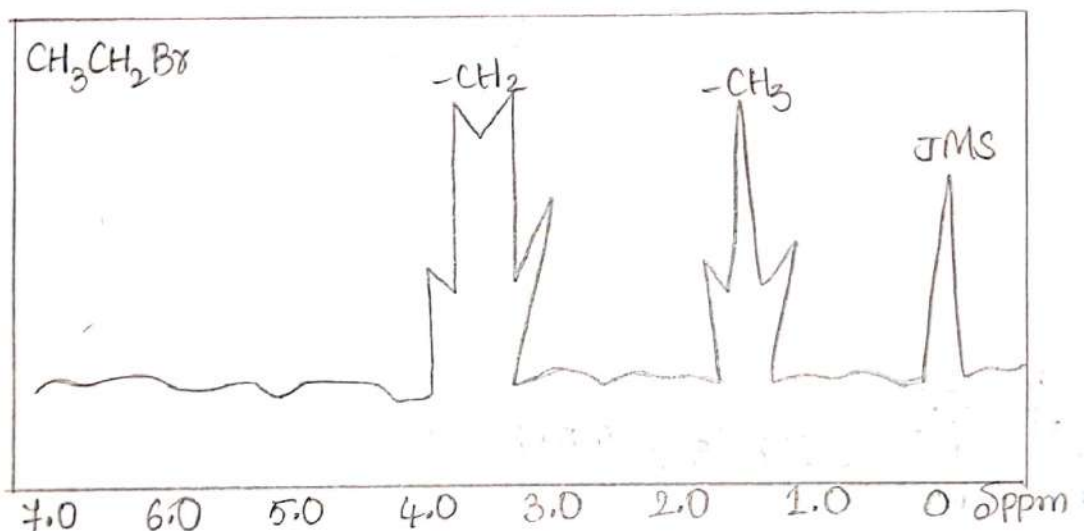
from $n+1$ rule

$$2+1=3 \text{ (Triplet)} (\delta=1.3)$$

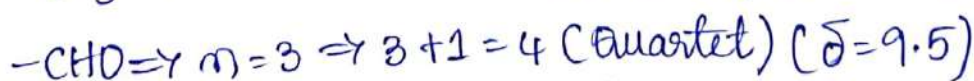
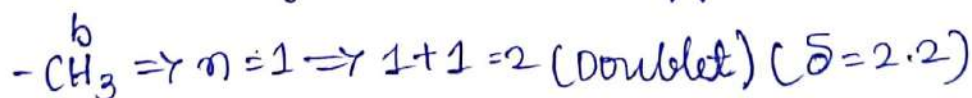
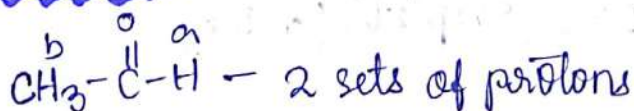
$\overset{b}{-CH_2}$



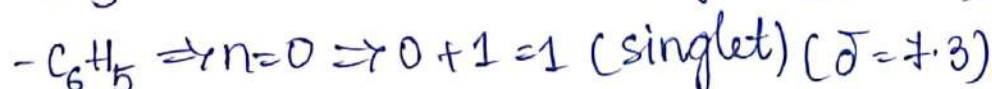
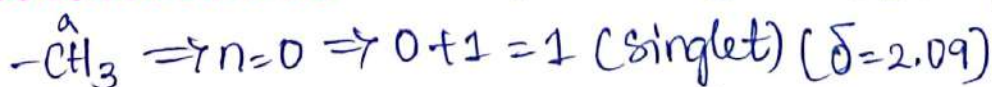
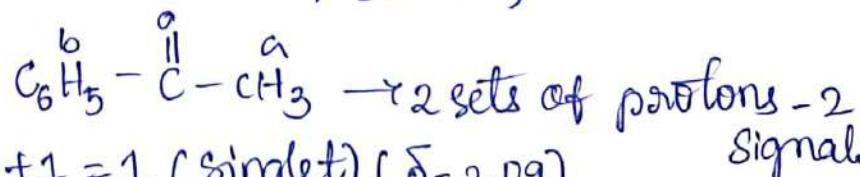
$$3+1=4 \text{ (Quartet)} (\delta=3.3)$$



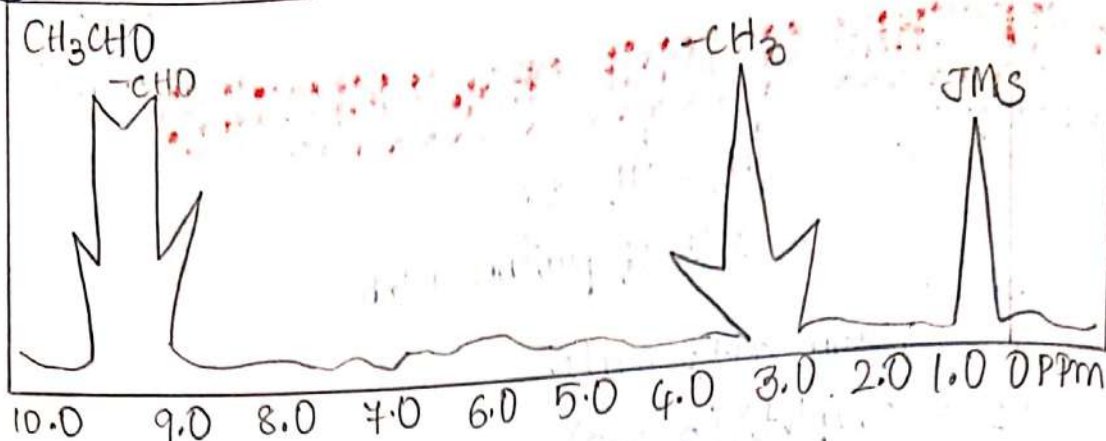
2) ACETALDEHYDE:-



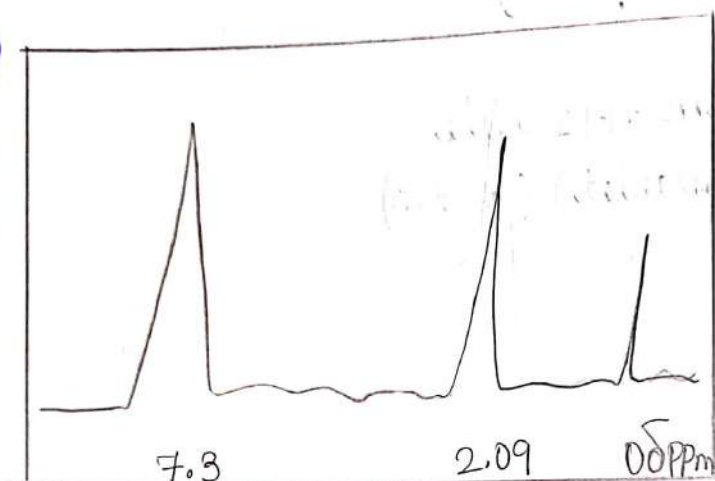
3) ACETOPHENONE:-



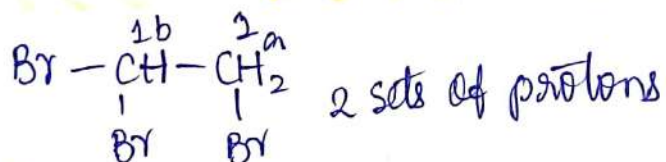
②



③

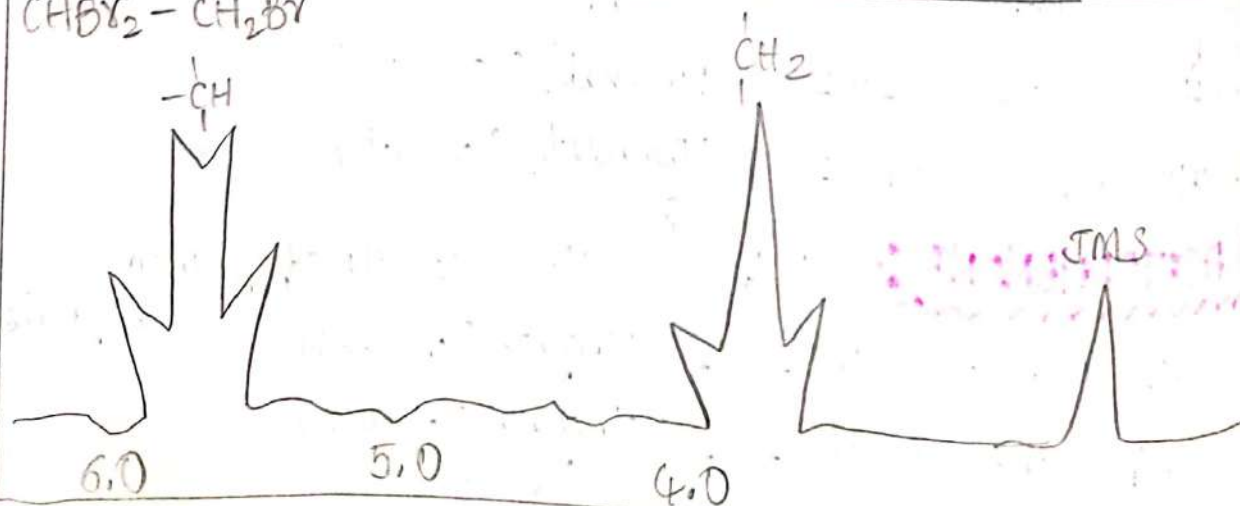


4.1.1.2 - 1,1,2-TRIBROMOETHANE:



$-\overset{a}{\text{CH}_2} \Rightarrow n=1 \Rightarrow 1+1=2$ (doublet) ($\delta=4.0$)

$-\overset{b}{\text{CH}} \Rightarrow n=2 \Rightarrow 2+1=3$ (triplet) ($\delta=5.8$)



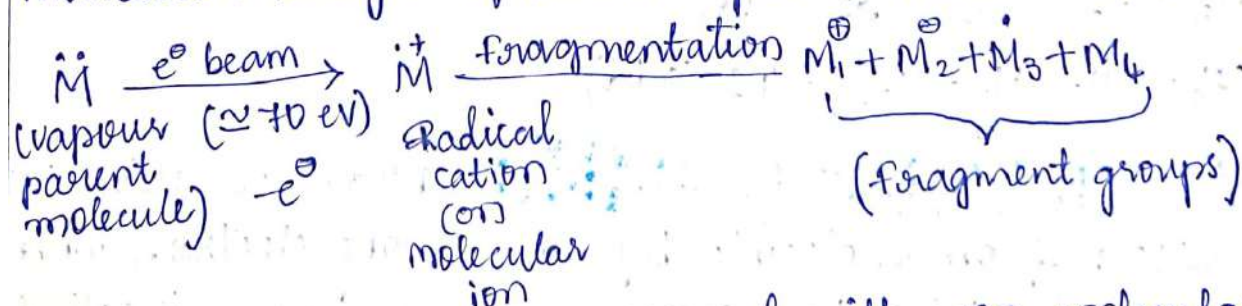
MASS SPECTROMETRY

In general in majority of Spectroscopy sample subjected to interaction with electromagnetic radiation but in mass spectrometry sample interacted with high energy e^- beam (≈ 70 eV).
 \Rightarrow Interaction between electron beam and sample molecules also called electron impact (or) Bombardment (or) collision.

PRINCIPLE:- Once vapour state molecule interacted with high energy e^- beam molecules of sample received energy from e^- beam, then loses one of its valency electron resulting species is high energy radical cation referred as molecular ion (or) parent ion (M^+).

\Rightarrow High energy molecular ion in order to undergo stabilisation involve in bond cleavages, then produces variety of small species called fragments and the process is called fragmentation.

\Rightarrow Mass instrument recognizes only +ve charged [cationic] fragments different cations has different m/z (mass/charge) values based on the m/z values of fragment ions, m/z value of parent molecule is determined from that molecular weight of the sample is determined.



NITROGEN RULE:- Compound with even molecular weight must contain even number of Nitrogen (or) No Nitrogens and with odd molecular weight must contain odd number of Nitrogen atoms.

It is applicable to Neutral compounds only.

Ex:-



PYRIDINE

M.Wt = 79 (odd)

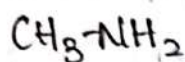
1 'N' atom



BENZENE

M.Wt = 78 (even)

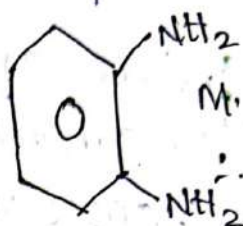
∴ Zero 'N' atom



METHYL AMINE

M.Wt = 31 (odd)

1 'N' atom



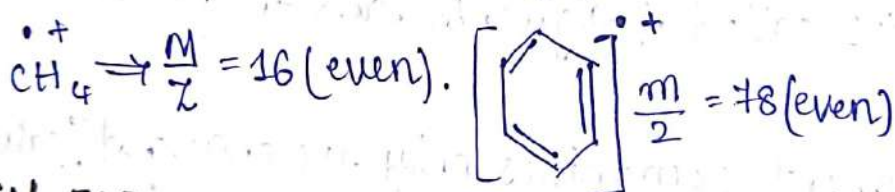
M.Wt = 108 (even)

∴ 2 'N' atoms

⇒ TYPES OF IONS:-

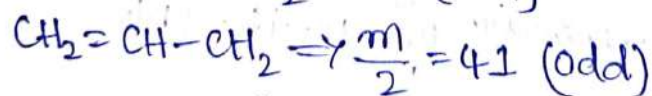
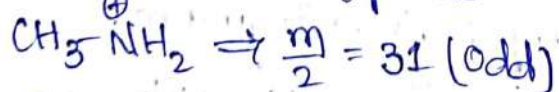
(1) ODD ELECTRON IONS:- Positive charged ions having odd no. of electrons are called odd electron ions.

Ex:- Radical cation (\dot{M}^+)

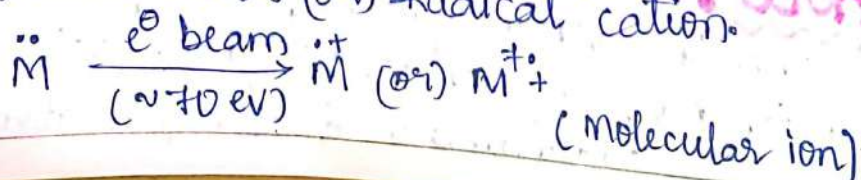


(2) EVEN ELECTRON IONS:- Positive charged ions having even no. of electrons are called even electron ions.

Ex:- cationic species.



(3) MOLECULAR ION/RADICAL ION (\dot{M}^+):- A Radical cation is produced from molecule by loss of one electron when bombarded with high energy electron beam is called molecular ion (or) Radical cation.

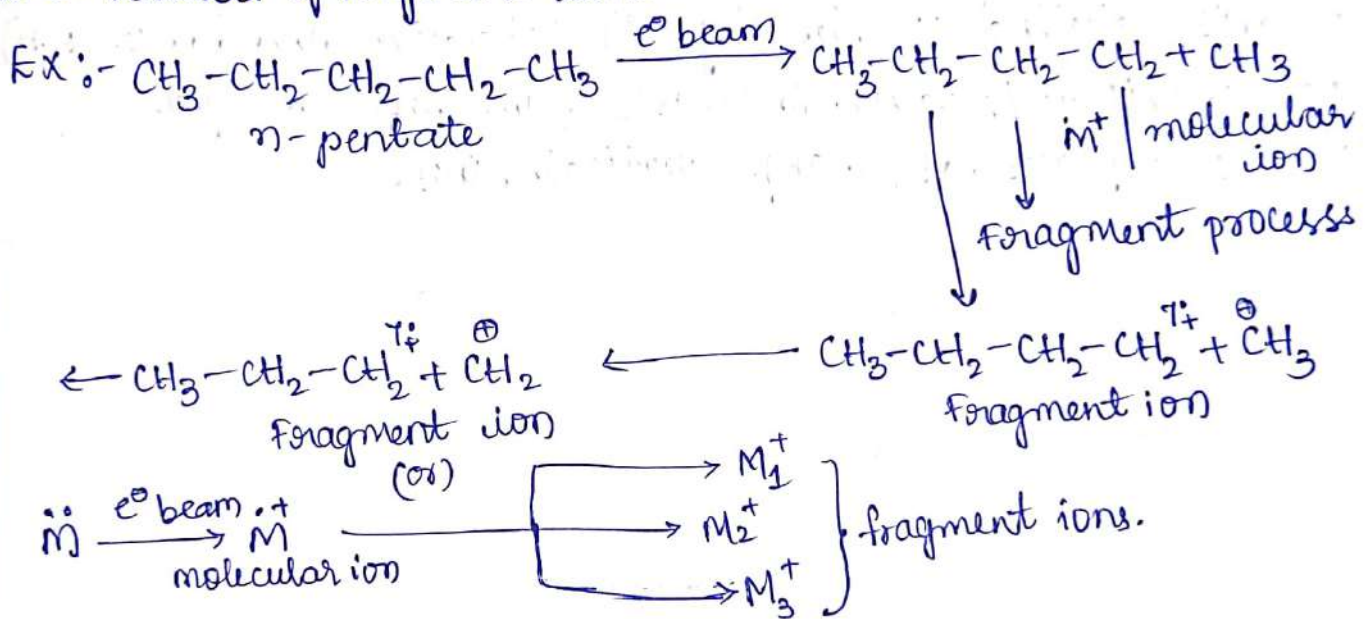


ISOTOPIC ION :- Ion having heavier isotopes of elements called isotopic ion. These are called $(M+1)$ & $(M+2)$ ions.

Ex:- $[^{12}\text{C}^{16}\text{O}]^{\cdot+}$ Normal ion/molecular ion.

$[^{12}\text{C}^{17}\text{O}]^{\cdot+}$ (or) $[^{13}\text{C}^{16}\text{O}]^{\cdot+} \rightarrow$ Isotopic ion.

FRAGMENT ION (or) DAUGHTER ION :- The positive ions obtained from a molecular ion in fragmentation process are called fragment ions.

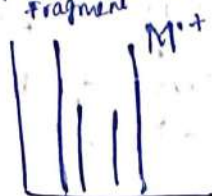


TYPES OF PEAKS :-

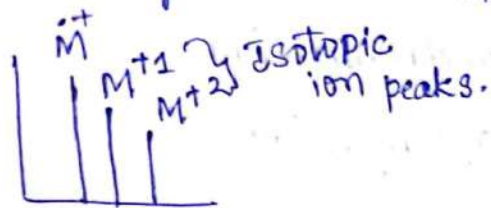
MOLECULAR ION PEAKS :- peak resulting from molecular ion of a sample is called molecular ion peak.

$\frac{m}{z}$ of $m^{\cdot+}$ peak is equal to molecular weight of compound.

FRAGMENT ION PEAKS :- peak appearing from fragment ions are called fragment ion peaks. These will always appear at left side of $m^{\cdot+}$ peak in mass spectrum.

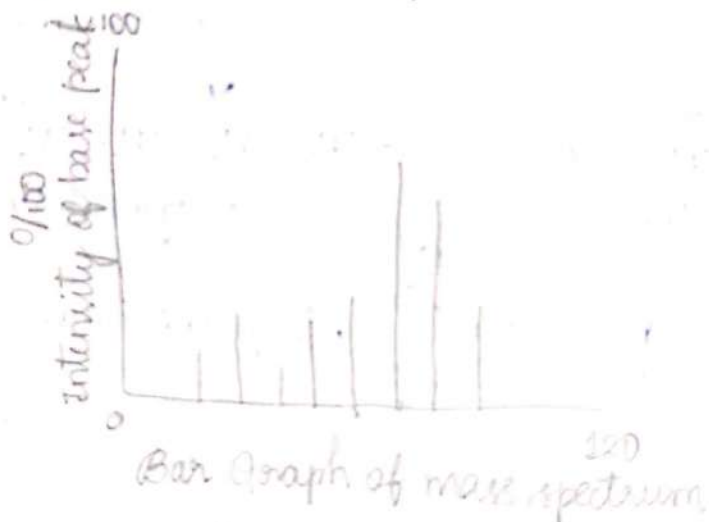


(3) ISOTOPIC ION PEAK: Peaks resulting from isotopic ions are called isotopic ion peaks. These appear always at right side of M^+ peak.



*** REPRESENTATION OF MASS SPECTRUM:-** A mass spectrum is a two dimensional graph of an intensity vs m/z values.

- \Rightarrow x-axis labelled with m/z values.
- \Rightarrow y-axis labelled % intensity (or) % Relative abundance (R.A)
- \Rightarrow on x-axis m/z value increases from left to right.
- \Rightarrow peaks appear as sharp - vertical lines.



\Rightarrow DETERMINATION OF MOLECULAR FORMULA:-

1. Observe the m/z of M^+ . If m/z of molecular ion is odd, molecule should contain odd number of Nitrogens, if m/z of M^+ is even, molecule should be with even (or) zero number of 'N' atoms.
2. Check the intensity of M^+ peak, that means M^+ peak is base peak or not with 100% intensity. Make it 100% and proportionally increase the intensity of $M+1$ & $M+2$ peaks.

$$\text{Relative Abundance (RA)} = \frac{\text{Selected peak abundance}}{\text{High R.A}} \times 100$$

Ex: $\bar{M}, \frac{m}{z} = 82 (80\%) = \frac{80}{80} \times 100 = 100\%$

$M+1, \frac{m}{z} = 83 (60\%) = \frac{60}{80} \times 100 = 75\%$

$M+2, \frac{m}{z} = 84 (40\%) = \frac{40}{80} \times 100 = 50\%$

3. By observing the ratio of \bar{M} & $M+2$ peaks, we can determine the presence or absence of Cl, Br & S atoms.

$\bar{M} : [M+2] \longrightarrow 1:1 \longrightarrow 1 \text{ 'Br' atom.}$

$\bar{M} : [M+2] : [M+4] \longrightarrow 1:2:1 \longrightarrow 2 \text{ 'Br' atom.}$

$\bar{M} : [M+2] \longrightarrow 3:1 \longrightarrow 1 \text{ 'Cl' atom.}$

$\bar{M} : [M+2] \longrightarrow 100:4.4 \longrightarrow 1 \text{ 'S' atom.}$

4. Assume N, S, O atoms are absent then 'C' is the main contributor for $(M+1)$ peak. Then no. of 'C's' equal to $\frac{\% (M+1) \text{ peak}}{1.11}$.

5. If N, S are present, no. of 'C's' equal to
$$\frac{\% (M+1) \text{ peak} - (\text{no. of 'N's'} \times 0.36) + \text{no. of 'S's'} \times 0.78}{1.11}$$

6. If in the molecule N, S, O are absent, then no. of 'H's' = $(M.wt - 12 \times \text{no. of 'C's'})$.

7. If N, S, O are present then no. of 'H's' = $M.wt - (12 \times \text{no. of 'C's'}) - (\text{no. of 'N's'} \times 14) + (16 \times \text{no. of 'O's'}) + (32 \times \text{no. of 'S's'})$.

\therefore Then the mol. formula is _____.

PROBLEM:-

$\bar{M} \Rightarrow \frac{m}{z} = 72 (73\%)$

$M+1 \Rightarrow \frac{m}{z} = 73 (3.3\%)$

$M+2 \Rightarrow \frac{m}{z} = 74 (0.15\%)$

1. $\frac{m}{z}$ of \bar{M} is equal to mass of comp.

$\frac{m}{z}$ of \bar{M} is 72, even mass.

\therefore It should be with even/zero 'N's'.

2. \dot{M}^+ peak, is not a base peak. Increasing the intensity & making it as 100% proportionality $m+1$ & $m+2$ peaks also increased.

$$\dot{M}^+ \Rightarrow \frac{m}{z} = 72 [73\%] = \frac{73}{73} \times 100 = 100\%$$

$$m+1 \Rightarrow \frac{m}{z} = 73 [3.3\%] = \frac{3.3}{73} \times 100 = 4.5\%$$

$$m+2 \Rightarrow \frac{m}{z} = 74 [0.15\%] = \frac{0.15}{73} \times 100 = 0.2\%$$

3. Intensity ratio of $\dot{M}^+ : m+2$ is 100:0.2
 \therefore Cl, Br, S atoms absent.

$$4. \text{No. of 'C's} = \frac{\% (m+1) \text{ Peak}}{1.11} = \frac{4.5}{1.1} = 4$$

\therefore No. of 'C' atoms = 4.

$$\begin{aligned} 5. \text{No. of 'H's} &= \text{M.wt} - (12 \times \text{no. of 'C's}) \\ &= 72 - (12 \times 4) \\ &= 72 - 48 \\ &= 24 \text{ H-atoms.} \end{aligned}$$

but it is not possible to attach '24' H-atoms to 4-'C's

6. Assume if 2N- are present

$$C_4N_2 \Rightarrow 4 \times 12 + 2 \times 14 = 48 + 28 = 76$$

\therefore It's not equal to $\frac{m}{z}$ of \dot{M}^+

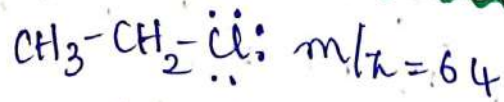
Assume if 'O' is present

$$C_4O = (4 \times 12) + (1 \times 16) = 48 + 16 = 64$$

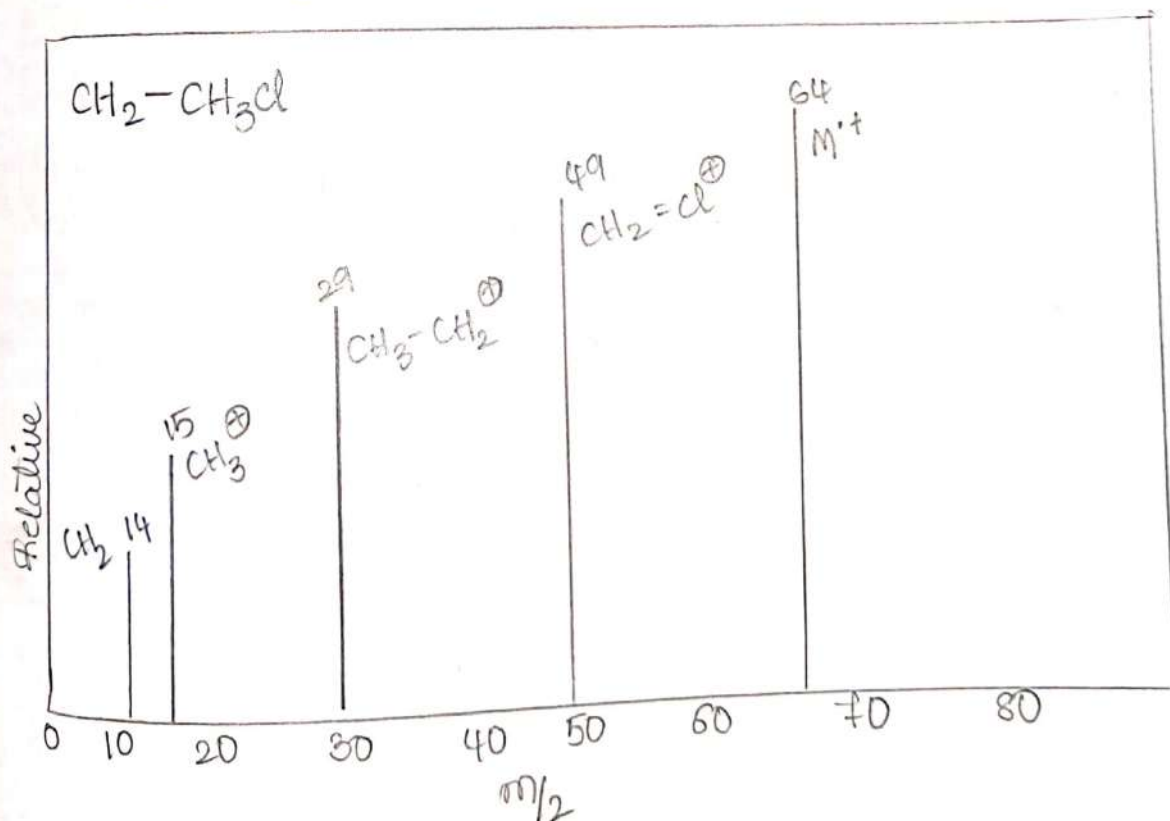
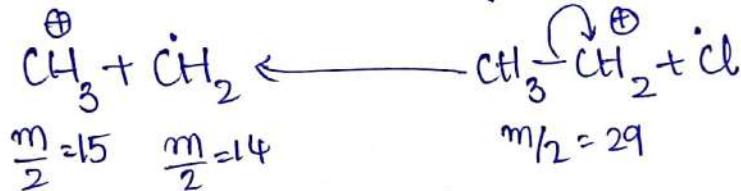
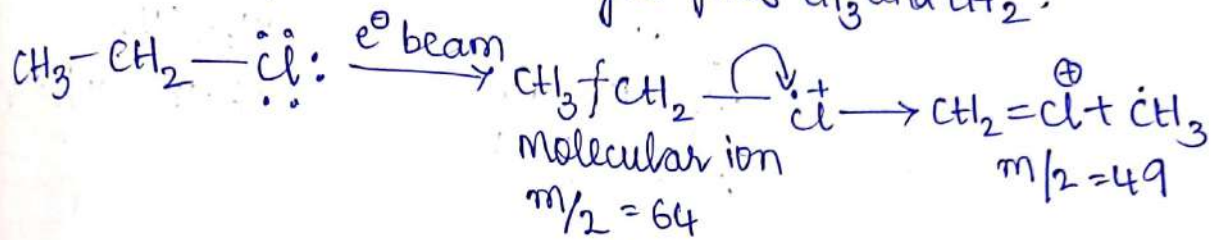
$$72 - 64 = 8 \text{ (H's)}$$

\therefore The mol formula is C_4H_8O .

MASS SPECTRUM OF ETHYL CHLORIDE :-



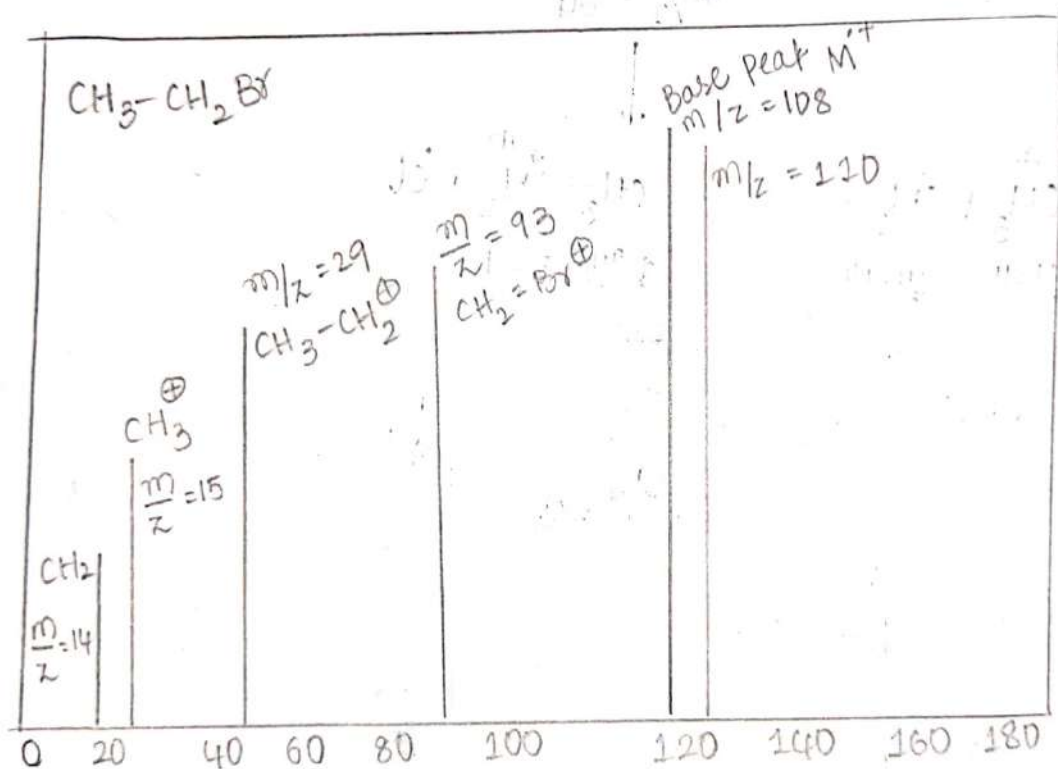
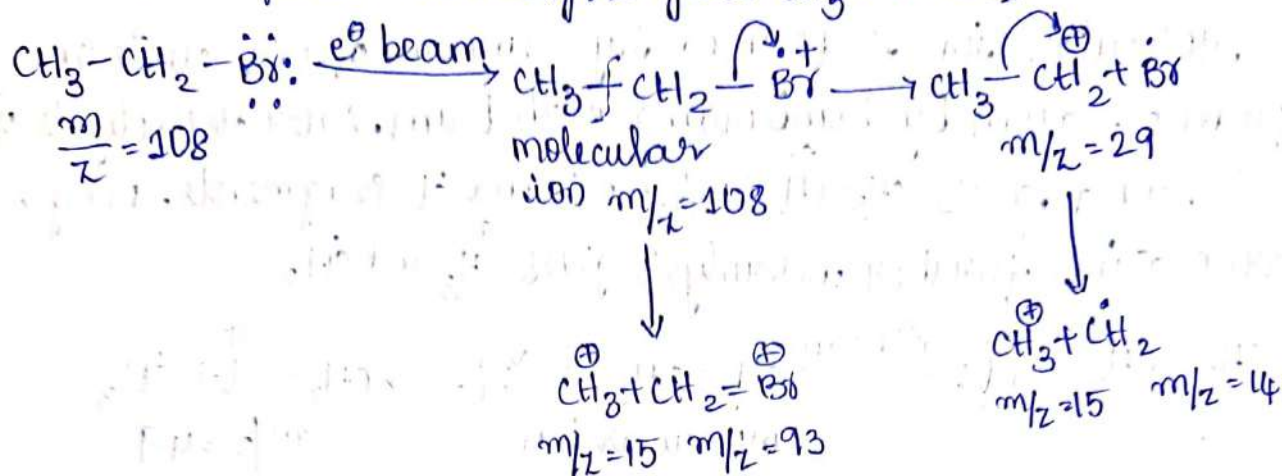
Molecular ion is formed by removal of one electron from Cl-atom by bombarding with beam. Later heterolysis of C-Cl bond gives $\text{CH}_3-\overset{\oplus}{\text{CH}}_2$ ($m/z = 29$) and Cl^\ominus fragments. Ethyl carbocation further heterolysis gives $\overset{\oplus}{\text{CH}}_3$ and CH_2^\ominus .



2) ETHYL BROMIDE :- $\text{CH}_3-\text{CH}_2-\ddot{\text{Br}}: \quad m/z = 108$

Molecular ion is formed by removal of one electron

from Br-atom by bombarding with e^- beam, heterolysis of C-Br bond gives $\text{CH}_3-\text{CH}_2^+$ ($m/z = 29$) and Br fragments. Ethyl carbocation further heterolysis gives CH_3^+ and CH_2^+ .



GOVERNMENT DEGREE COLLEGE, BHUPALPALLY
JAYASHANKAR DISTRICT - 506169



DEPARTMENT OF CHEMISTRY
STUDENT STUDY PROJECT

2019-20


TITLE : APPLICATION OF ELEMENTS IN OUR DAILY LIFE

Certified that this is a bonafiede work done by the following B.Sc I year students of this college in the subject of chemistry

NAME OF THE STUDENTS:

1. A.ROSHINI — A. Roshini
- 2 N.AKSHITHA — N. Akshitha
3. G.SANJAY — G. Sanjay
4. B.POOJITHA — B. Poojitha
- 5 R.MAHA LAXMI — R. Mahalaxmi
6. B.LAXMI — B. Laxmi
7. D.MANJULA — D. Manjula

SUPERVISED BY


B.SANDHYA RANI

Lecturer in chemistry


Principal

Govt. Degree College, Bhupalpally
Dist. Jayashankar & Bhupalpally

Government

Degree College

Chemistry - SEM-II

Project Work

Name :- A. Kishor

Class :- B.Sc. B.Ed. 1st year

Topic :- what are elements? what are the
applications of elements in our daily life?

Submitted to,

Sandhya Rani
Maam

Students Participated

- (1) A. Roshini
- (2) N. Akshitha
- (3) B. Pujitha
- (4) A. Sri Vennela
- (5) B. Laxmi
- (6) G. Sengay
- (7) R. Mahalaxmi
- (8) N. Lavanya
- (9) D. Mangula

What is an Element? What are the Applications of Elements in our Daily Life?

INTRODUCTION :-

In chemistry, an element is a pure substance consisting only of atoms that all have the same numbers of protons in their nuclei. Unlike chemical compounds, chemical elements cannot be broken down into simpler substances by any chemical reaction. The number of protons in the nucleus is the defining property of an element, and is referred to as its atomic number (represented by the symbol Z). All atoms with the same atomic number are atoms of the same element.^[1] All of the baryonic matter of the universe is composed of chemical elements. When different elements undergo chemical reactions, atoms are rearranged into new compounds held together by chemical bonds. Only a minority of elements, such as **silver and gold** are found uncombined as relatively pure **native element minerals**. Nearly all other naturally occurring elements occur in the Earth as compounds or mixtures. Air is primarily a mixture of the elements nitrogen, oxygen and argon, though it does contain compounds including carbon dioxide and water.

SCOPE OF STUDY :-

The history of the discovery and use of the elements began with primitive human societies that discovered native minerals like carbon, sulphur, copper and gold (though the concept of a chemical element was not yet understood). Attempts to classify materials such as these resulted in the concepts of

classical elements, alchemy and various similar theories throughout human history. Much of the modern understanding of elements developed from the work of Dmitri Mendeleev, a Russian chemist who published the first recognisable periodic table in 1869. This table organizes the elements by increasing atomic number into rows (periods) in which the columns (groups) share recurring (periodic) physical and chemical properties. The periodic table summarises various properties of the elements, allowing chemists to derive the relationships between them and to make predictions about compounds and potential new ones.

By November 2016, the **International Union of pure and applied chemistry** had recognised a total of 118 elements. The first 94 occur naturally on Earth, and the remaining 24 are synthetic elements produced in nuclear reactions. Save for unstable radioactive elements (radionuclides) which decay quickly, nearly all of the elements are available industrially in varying amounts. The discovery and synthesis of further new elements is an ongoing area of scientific study.

Everything around us is made of atoms, without atoms the chemical elements couldn't exist. Without chemical elements, then wouldn't exist, then proteins wouldn't exist, then life wouldn't exist. We are made of atoms, just like everything else.

We need a lot of chemical elements in our diet to have a healthy life. Everything in us and around us made of elements. Metals were elements. Most of the elements in our bodies and in

AIMS OF THIS PROJECT:-

- 1) To know the importance of the elements in our daily life
- 2) To identify the which are useful elements and which are harmful to us
- 3) What are the resources for our useful essential elements
- 4) To know the elements which are used in the medicines and industries.

plants and animals are combined into molecules. The atmospheric gases are molecules of 2 or more

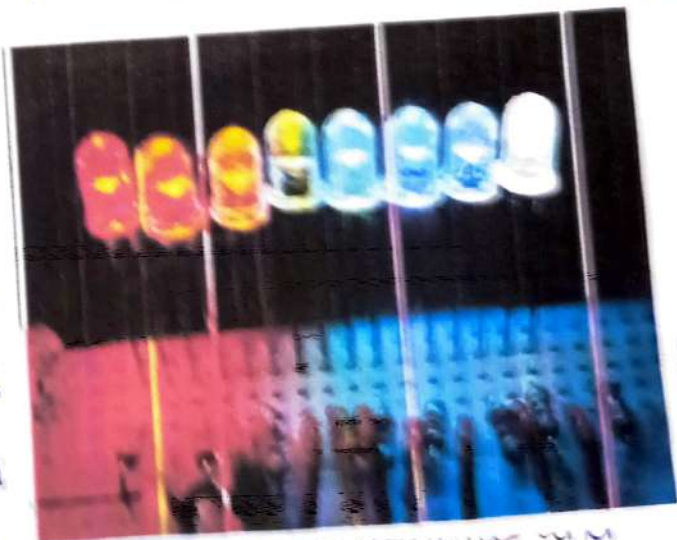
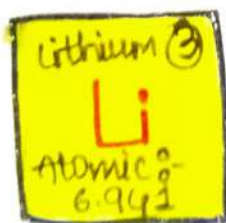
USES OF ELEMENTS IN OUR LIFE:



HYDROGEN (H), a colourless, odourless

tasteless, flammable gaseous substance that is the simplest member of the family of chemical elements. Under ordinary conditions, hydrogen gas is a loose aggregation of hydrogen molecules, each consisting of a pair of atoms, a diatomic molecule, H_2 . This hydrogen belongs to s-block element. Hydrogen is also has many other uses. In the chemical industry it is used to make ammonia for agricultural fertiliser (the Haber process) and cyclohexane and methanol, which are the intermediates in the production of plastics and pharmaceuticals. It is also used to remove sulfur from fuels during the oil refining process.

DESCRIPTION:- Hydrogen is an explosive gas and also the lightest element.



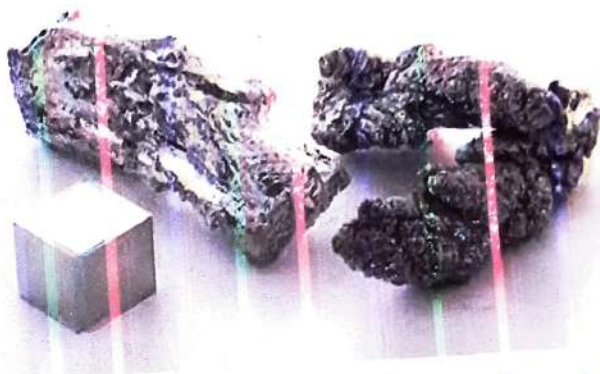
LITHIUM (Li) is an alkali element. It has the low density & reacts with water. The most important use of lithium is in rechargeable batteries for mobile phones, laptops, and electric vehicles. Lithium is also used in some non-rechargeable batteries for things like heart pacemakers, toys and clocks.

the metal itself - which is soft, white, and lustrous - and several of its alloys and compounds are produced on a industrial scale. Lithium and its compounds have several industrial applications, including heat resistant glass and ceramics, lithium grease lubricants, flux additives for iron, steel and aluminium production, lithium batteries. These uses consume more than three-quarters of lithium production. Most surprisingly, in psychiatric medicines as a mood stabilizer.

DESCRIPTION:- Under standard metal and is soft and reactive



BERYLLIUM [Be] is



element with the feature of a little alkaline earth metal. It is a divalent element that occurs naturally only in combination with other elements to form minerals. Beryllium is used in alloys with copper or nickel to make gyroscopes, springs, electrical contacts, spot-welding electrodes and non-sparking tools. The concentration of beryllium in both saw carrots and field corn can be seen and grown in the United States is less than 25 micrograms. It is also used in electrical applications, manufacture of telecommunications, infrastructure equipment, computers and cell phones.

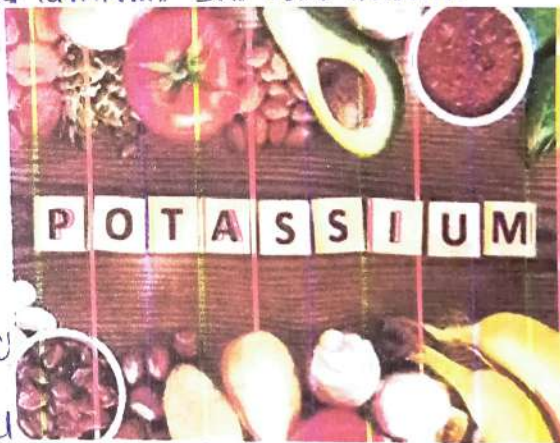
DESCRIPTION:- Beryllium is a light weight metal



SODIUM (Na) is a soft, silvery metal. Sodium is an alkali metal, belongs to s-block elements. Sodium is used as a coolant in nuclear reactors, and as a reagent in the chemicals industry. But sodium salts have more uses than the metal itself. The most common compound of sodium is sodium chloride (common salt). It is added to food and used to de-ice roads in winter. It is also used in street lights to produce yellow light as well as being a component in many compounds like table salt, soda ash, borax and baking soda.

active
goes to
be

DESCRIPTION:- Sodium is a very reactive, soft metal.



POTASSIUM (K) is a soft, silvery metal. Potassium is an alkali metal belongs to s-block elements.

Potassium is used in compounds. It is combined with chlorine to produce potassium chloride, which is used in fertilisers, pharmaceuticals and saline drips. Potassium hydroxide is used in soaps and cleaners, while potassium carbonate is used in the manufacturing of glass. And also, potassium is an essential mineral and electrolyte involved in heart function, muscle contraction and water balance.

is an
used

A high intake may help reduce high blood pressure, salt sensitivity and the risk of stroke. Additionally, it may protect against osteoporosis and kidney stones.

DESCRIPTION: potassium is a flammable and reactive chemical and a fire and an explosion hazard, and a soft metal too.



CALCIUM [Ca] calcium is used to prepare thorium and uranium as a reducing agent. It is also used in the production of some metals, as an alloying agent. calcium carbonate is used to make cement and mortar and also in the glass industry. calcium carbonate is also added to the toothpaste and mineral supplements. calcium carbide is used to make plastics and to make acetylene gas. It is also used as alloying agent in aluminium, copper, lead and magnesium. It is the most abundant mineral in the body and it is vital for bone health. Humans need calcium to build and maintain strong bones, and 99% of the body's calcium is in the bones and teeth. The calcium belongs to s-block elements.



CARBON (C) is unique as to form strongly bonded chain. These hydrocarbons are mostly used as fuels and as a raw stock for the production of polymers, fibres, paints, solvents and plastics. Impure carbon in the form of charcoal (from wood) and coke (from coal) is used in metal smelting. Graphite is used for pencils, crucibles and electrodes. Pure diamond is also entirely made of carbon atoms. The discovery of carbon nanotubes, fullerenes, and atom thin sheets of graphene has led to the use in the electronic industry and in nanotechnology, gradually the carbon to p-block elements.

DESCRIPTION:- There are a number of pure forms of this element including graphite, fullerenes, diamond and graphene. The nanofoms, fullerenes and graphene appear as black or dark brown, soot-like powders.



NITROGEN (N) 78% of Earth's entire atmosphere is made up of nitrogen. The element is significant to the chemical industry as it is the key nutrient in fertilisers and a key component in nitric acid, nylon and explosive materials. The Haber's process is

a well known method of reacting nitrogen with hydrogen to create ammonia. And this Nitrogen belongs to p-block elements

DESCRIPTION:- Nitrogen is a colourless gas.



OXYGEN(O) Many living things, including humans, use oxygen for respiration. pure oxygen is used to treat breathing problems and makes spacecraft livable. Oxygen in industry is mainly used in the manufacturing of steel and other metal alloys. Large quantities are also used in the manufacture of chemicals such as nitric acid and hydrogen peroxide. It is also used as an antifreeze and to make polystyrene and chloroethane, the precursor to PVC. Oxygen gas is used for oxy-acetylene welding. A growing use is

DESCRIPTION:- Oxygen is a colorless gas.



SULPHUR(S) sulphur

and others

pyrotechnics, rubber manufacturing, and as an insecticide, fungicide, and fumigant. It can also be used to treat skin diseases. However, its prime use is in the compound separation.

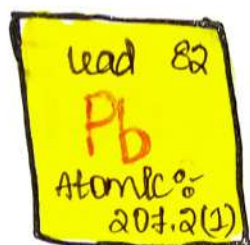
And this sulphur belongs to p-block elements.

DESCRIPTION:- Sulphur is a little yellow solid



CHLORINE (Cl) Chlorine is used in water treatment and as an antiseptic. During the production of papers, plastics, solvents and textiles, and large amounts of chlorine are also used. This chlorine belongs to d-block elements.

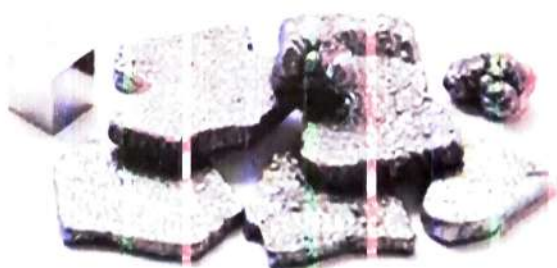
DESCRIPTION:- Chlorine is a greenish poisonous gas.



LEAD (Pb) Many previously common uses of lead have now been banned, due to its toxic effects. This element belongs to d-block. It is still widely used for car batteries, pigments, ammunition, cable sheathing, lead crystal glass, radiation protection, in pencils and in some solders. This lead is very harmful and dangerous.

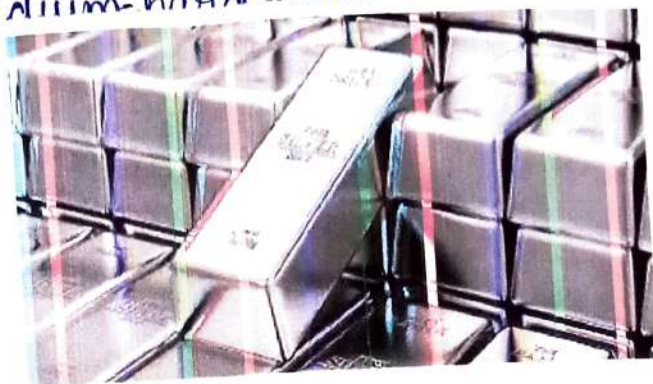
DESCRIPTION:- Lead is a d

c metal.



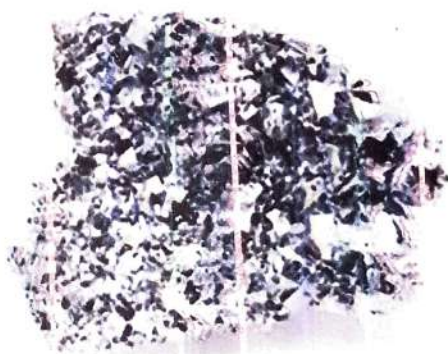
IRON (Fe) this element belongs to d-block element. Iron's prime use is in making steel. When steel is combined with chromium, it produces stainless steel which is resistant to corrosion.

DESCRIPTION: - Iron is a medium-hard metal and has retic properties.



ZINC [Zn] is used as an alloying agent in brass, nickel, silver and aluminium. Paints, rubbers, cosmetics, batteries, textiles and inks also have a significant need for the element. This is a chemical element belongs to d-block element. This is also used in electrical appliances.

DESCRIPTION: - Zinc is a non-



MOLYBDENUM (Mo) is used to make alloys used in missile and aircraft parts as well as the nuclear power industry and in heating elements. It can be used to refine petroleum, but its main use is as an alloying agent to refine steel. This molybdenum belongs to d block element. Molybdenum disulfide is used as a lubricant additive.

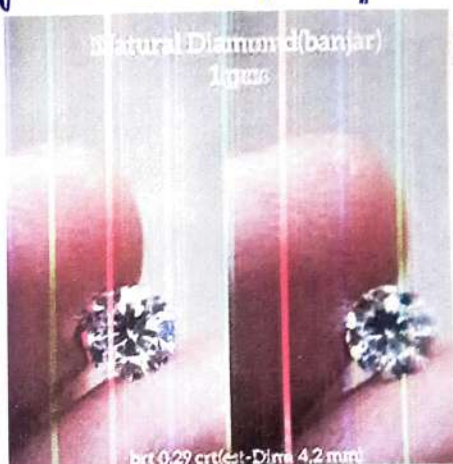
DESCRIPTION:- molybdenum :



PALLADIUM (Pd) palladium belongs to d-block elements.

palladium is an important element of the catalytic conversion process. It is also used in jewelry and dental fillings.

DESCRIPTION:- palladium is a metal that readily absorbs hydrogen.

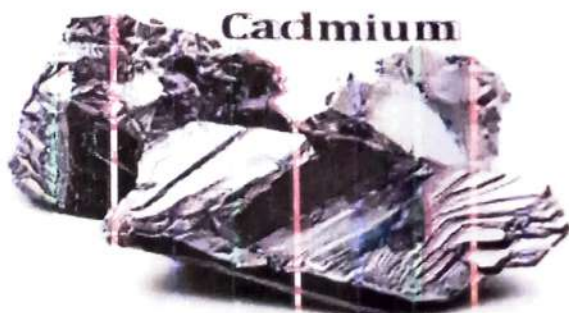


tal that

SILVER [Ag] silver is used in jewelry and tableware. It

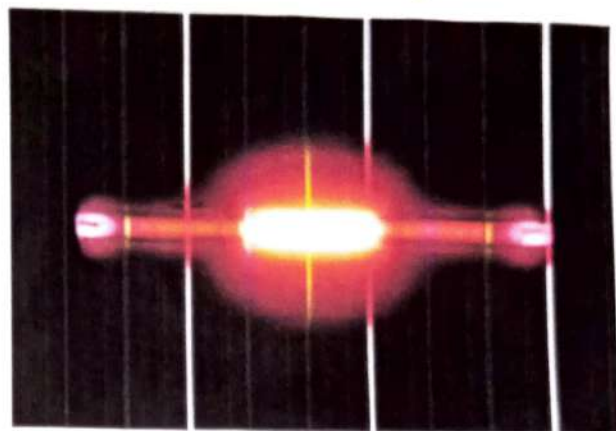
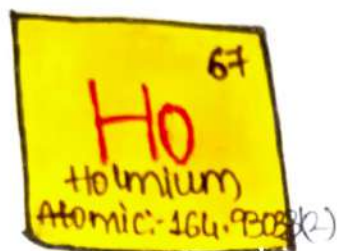
is the best reflector of white visible light, although it does tarnish. This silver is a chemical element belongs to d-block elements. It is used in soldering and brazing compounds as well as batteries. Silver paints are used for making printed circuits. Silver also has antibacterial properties.

DESCRIPTION:- Silver is a soft shiny metal is the that best electrical conductor.



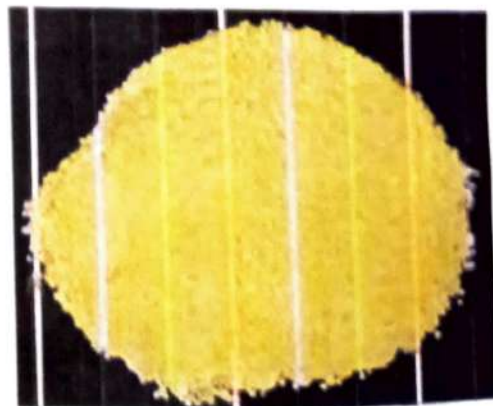
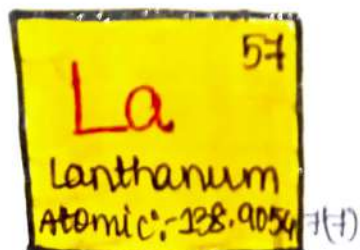
CADMIUM [Cd] is poisonous, so it has few practical uses. This is a chemical element belongs to d-block elements. It can be used to prevent corrosion or to absorb neutrons in nuclear reactors. One of its more commercial uses is in the rechargeable nickel-cadmium batteries.

DESCRIPTION:- Cadmium is a non-corroding soft metal is that looks like toxic.



LANTHANUM [La] Lanthanum is used along with other earth elements to make arc lights. This is a chemical element belongs to f-block elements. It also makes up about 20 percent of mischmetal, an alloy used in the flint of cigarette lighters. A lanthanum-nickel alloy is used to store hydrogen gas for use in hydrogen powered vehicles and Lanthanum is also used in nickel metal hydride batteries.

DESCRIPTION:- Lanthanum is a



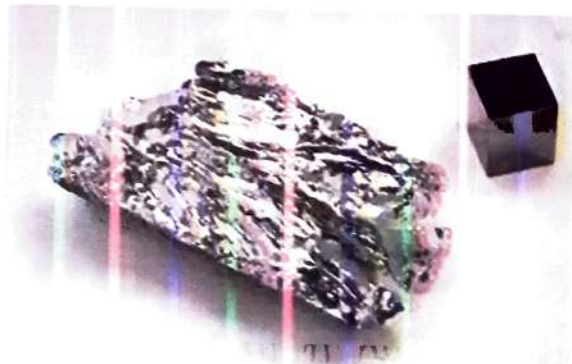
HOLMIUM (Ho) Holmium is used in the production of magnets as a flux concentrator. This is a chemical element belongs to f-block elements. It is also used as a yellow or steel colour in cubic zirconia manufacturing.

DESCRIPTION:- Holmium is



OSMIUM [Os] Osmium is mainly used to make hard metal alloys. This chemical element belongs to f-block elements. You can find it in ball point pens tips, record needles, electrical contacts, and other metal components where friction needs to be mitigated.

DESCRIPTION:- Osmium is mainly used to make hard metal alloys and also, is a non-corroding high-melting-point hard metal and is the densest element.



ACTINIUM (Ac) Actinium is used as medicine for radio-immunotherapy. It is only found in uranium ore, which makes it very expensive. This is a chemical element belongs to f-block.

elements. One ton of uranium produces the equivalent of 2/28 of a gram of actinium.

DESCRIPTION: - Actinium is a long-lived.



URANIUM (U) Uranium, is used as a nuclear fuel for nuclear power reactors and reactors and produces the material needed for nuclear weapons. This chemical element belongs to f-block elements. It is also used as a colorant for glass. It is also the major material from which other synthetic transuranium elements are made.

DESCRIPTION: - Uranium is long-lived.



AMERICIUM (Am)

f-block element. Americium is used in smoke detectors and as a portable source of gamma rays.

DESCRIPTION: - Americium is a radioactive element that is long-lived.

CONCLUSION :-

- 1) Our Body built with mainly 10 essential elements
- 2) Cu used mostly in making Utensils and for conduction of bolts, heat and electricity.
- 3) Ag, Au, Pt are used in making coins & ornaments.

GOVERNMENT DEGREE COLLEGE, BHUPALPALLY
JAYASHANKAR DISTRICT - 506169



DEPARTMENT OF TELUGU
STUDENT STUDY PROJECT

2019-20

TITLE : తెలుగు వారి పండుగ దావావళి - నేపథ్యం

Certified that this is a bonafide work done by the following BA II year students of this college in the subject of Telugu

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తెలుగు వారి పండుగ
దీపావళి నైవేద్యం

BA I, II, III years students, GDC భూపాలవల్లె

హిందువుల ఆనందంగా గురువకునై పండుగలలా దీపావళి
ముఖ్యమైనది. ఈ పండుగ ప్రతి సంవత్సరం ఆక్షేయం బహుళ
తిథి వాస్తవనాడు వస్తుంది. ఈ పండుగ పిల్లలకే కాదు పెద్దలకు
చాలా ఇష్టం.

దీపావళి రింటే "దీపాల వరుస" అని అర్థం. ఈ పండుగ నాడు
హిందువులందరూ తమ ఇళ్ళముందు దీపాలను వెలిగించి
వరుసగా ఉంచుతారు. అందుకే ఈ పండుగను దీపావళి
అంటారు.

చారిత్రక నైవేద్యం:-

పూర్వం ఒక అసురుడు ఉండేవాడు. అతని వేరు నరకాసురుడు.
అతడు ఆడవారిని బంధించాడు. మునులను, దైవతాలను
హింసించాడు. ప్రజలను బంధించాడు. అతని బాధలు
భరించలేక ప్రజలు, దైవతాలు శ్రీకృష్ణుని వద్దకు వెళ్ళారు.
నరకాసురుని నుండి కాపాడమని ప్రార్థించారు. కృష్ణుడు
"సతి" అన్నారు. తన భార్య సత్యభామను ఎదుర్కొని వెళ్ళాడు.
నరకాసురుడు ప్రయోగించిన బాణం కృష్ణునికి తగిలించి.
అతను మూర్ఛ పోయాడు. అప్పుడు సత్యభామ నిల్చి అందుకొని
నరకాసురునిలా సమశం చేసింది. కానివటికి కృష్ణుడు
మూర్ఛ నుండి లేచాడు. నరకాసురుని చంపాడు. నరకుడు
చనిపోయిన నాటి అభి చతుర్దశి. అందుకే ఆ రోజును
"నరకచతుర్దశి" అని పిలుస్తారు.

కం సురకు చని పోయినందుకు దేవతలు, మనుషులు, ప్రభులు
సంతోషించారు. ఆ మరునాడు దీపాలను వెలిగించి
సంతోషంతో సంబరాలు జరుపుకున్నారు. దీనిని
"దీపావళి" అంటారు.

మరొక చారిత్రక నైవేద్యం

ఒకప్పుడు పరిచక్రవర్తి అని రాక్షసరాజు ఉండేవాడు.
అతనిని చంపడానికి విష్ణుమూర్తి వామనుని పంపిస్తా
వచ్చాడు. ముంగం చెన్నున్న పరిచక్రవర్తిని మూడుడుగుల
నైలను అడిగాడు. పరిచక్రవర్తికి వామనుని ప్రాంతం
దీనివ్వండి విష్ణుమూర్తి అని తెలుసు. అయినా కాదనకుండా
వానం ఇస్తానని మంట ఇచ్చాడు. వామనుడు ఆకాశమంత
ఎత్తు పెరిగాడు. ఒక అడుగు అని భూమిని, మరొక అడుగు
ఆకాశాన్ని ఆక్రమించాడు. మూడవ అడుగును పరిచక్రవర్తి
శరస్సు వైపు పట్టి అతనిని పాతాళానికి తోడ్కొచ్చాడు.
పరిచక్రవర్తిని వామనుడు పాతాళానికి తోడ్కొ
సంహరించి కూడా దీపావళి నాడే అని పరిష్కారం
కలదు.

రాముడు నీలాంశులకు అర్చనావాసం చేసేటప్పుడు
రావణుడు నీలను లంకకు అనుసరించాడు. రాముడు
వానశస్త్రంతో లంకకు వెళ్లి రావణుని చంపాడు.
నీలను అనుకొని అపొద్దును తిరిగి వచ్చాడు. రాముడు
తిరిగి వచ్చిన రాముని ప్రభుల పండుగ చేసుకున్నారని ఆ
రాక్షసి దీపావళి అని కొంతమంది అంటారు.

వివాహ వివాదంను ఇంట్లోనే కాకుండా భారతదేశ
మంతా అనంతమవుతుంది అనిపించుకుంటారు.
నరకచతుర్దశినాడు అలంకరిస్తానని చెప్తారు. మరల
వెళ్లి 'నరకాసుర దహనం' చెప్తారు.

వివాహ నాడు కొత్త బట్టలు ధరిస్తారు. పిండి వంటలతో
భోజనాలు చేస్తారు. చిక్కటి పడిన తరువాత దీపాలను
వరుసగా దీపం వంటిది లింకరిస్తారు. బాణాసంచా
కాల్చుతారు. టపాసులు, చిచ్చులు, భూవక్రాలు,
విశ్వవక్రాలు, దీపాలు సువాసనలు వెలిగిస్తూ పిల్లలు,
పద్మ అనందిస్తారు. ఈ బాణాసంచా కాల్చేటప్పుడు
అందరూ జాగ్రత్తగా ఉంటారు. లేకపోతే ప్రమాదాలు
వరుగులాయి.

వివాహ వివాదంను ఇక్కడ భూమి సంతాన వస్తుంది
గదా! ఆ రోజుల్లో వానలు పడుతూ ఉంటాయి. భూమి
చిత్తడిగా ఉంటుంది. శరీరాలు, దేహాలు, సూర్యుని వలన
కలుగుతాయి. బాణాసంచా కాల్చేటప్పుడు
వచ్చే పొగ వల్ల సూర్యుని వలన నశిస్తాయి. రోగాలు రావు.
ఈ విధంగా వివాహ వివాదం అయితే ప్రమాదాలు

(ఇవి చేయండి)

అలా-చింత రామండి.

* క్రింది పండుగలు ఏ మహాల వారు జరుపుకుంటారు తెలపండి.

1. క్రిరామ నవమి -
2. బక్రీదు -
3. క్రిస్మస్ -
4. మహావిశ్వయత - శైవలు
5. బుద్ధ పూర్ణిమ - బౌద్ధులు

II

~~క్రిరామ~~ భాగాలు

1. దివానావళి రింటికే _____
2. క్రిష్ణాని భార్య _____
3. వామనుడు బలచక్రివర్తిని _____ నెలకు ఉడిగాడు

III

ఒక్కొక్కమాటకు ఇవాలి చెప్పండి.

1. మునులు, దేవతలను పొందించిన రాక్షసుడు ()
2. నరకాసురుడు చనిపోయిన నాటి అథి పాది ()
3. బలచక్రివర్తిని చంపడానికి వజ్రాస్త్రపు
రూపంగా వచ్చాడు? ()
4. నాలుగు రావణుడు ఏక్కడికి ఆసనాని ()
పక్కాడు

పదజాలం

1) రిథాలను తెలుసుకోండి.

1. శిశువు =

2. మామం =

3. వామనడు =

4. దహనం =

2) వ్యతిరేక పదాలు

1. ముందు X

2. సంతోషం X

3. కొత్త X

4. భిక్షువు X

3) క్రింది ప్రశ్నలకు సమాసాలు రామండి.

1. బిషావళికి నువ్వు వెళ్ళిపో బావాసంబావెళ్ళు
తెలుపండి.

2. విశ్వమూర్తి దశావలూరంకాలను పొందండి.

3. పాండువులు కురువులనై పండ్లగల పౌరుషు పొందండి.
తెలుపండి.

GOVERNMENT DEGREE COLLEGE, BHUPALPALLY
JAYASHANKAR DISTRICT - 506169



DEPARTMENT OF HISTORY
STUDENT STUDY PROJECT

2019-20

TITLE : KALESHWARM TEMPLE – A STUDY

Certified that this is a bonafiede work done by the following B.A. II year students of this college in the subject of History

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KALESHWARAM TEMPLE

INTRODUCTION:

Kaleshwaram is a town lying on the border of Telangana and Maharashtra. The town is popularly known for its ancient and famous Kaleshwara Mukteshwara Swamy Temple. This is a revered temple dedicated to the worship of the powerful Lord Shiva. The most iconic aspect in this ancient temple is the presence of two Lingams holding on to a single pedestal or the Panavattam. The temple gets its name Kaleshwara Mukteshwara Swamy mandiram because of the dual presence of Lord Shiva or the Mukteshwara and the other is the Lord Yama or Kaleshwar.

It is also believed that the Kaleshwara Mukteshwara Swamy temple is one of the three temples of Lord Shiva of Trilinga Desham. All the three temples are considered as Jyotirlingas that ornament the three corners of Telugu Land. The other two temples constituting the Trilinga Desam are at the Draksharamam and Srisailem. The Jayashankar Bhupalpally temple boasts of several unique features, one of which is the hole in the Mukteshwara linga which can never be filled with water. The reason behind it is still a wonder. Many researchers have failed to provide any explanation for this. However, there are a few indications of a possible underground passage which goes all the way to the River Godavari which could provide a logical explanation. Another special attraction of this temple is the interesting sculpture of the fish idol.

KaleshwaraMukteswara Swamy Temple History:

Legend claims that a long time ago, a Vaishya, (a person who hails from the community, which takes care of the cattle) had performed an

Abhisheka to Lord Kaleshwara Mukteswara with hundreds of milk pots, and the milk evolved at the Sangamam, confluence of Godavari and Pranahita. Since then the temple is known to all the people across Telangana.

This temple is built in the Dravidian style architecture. It has several intricately carved pillars, and halls, which are used for conducting, festivals, and other social events like marriage, concerts, and pujas. The temple is known for the hole in the Mukteshwara linga and is believed that it can never be filled with water, which remains an enigma. However, many people attribute the connection of Shiv Linga and the river Godavari. The fish sculpture is iconic and receives a lot of attention.

DARSHAN:

The temple is open from 4:00 a.m.-1:00 p.m. and 3:30-8:00 p.m.

Access to Laksha Bilwapatri Pooja is by request to Dewasthanam officials at least one month in advance.

Two types of prasadam are inside the temple: Pulihora (Tamarind rice) and Laddu (sweet). This place is very popular for after funeral events like Kashi. People believe that this is second Kashi in India.

OBJECTIVES OF STUDY:

Kings of Kakatiya developed many temples in Kaleshwara

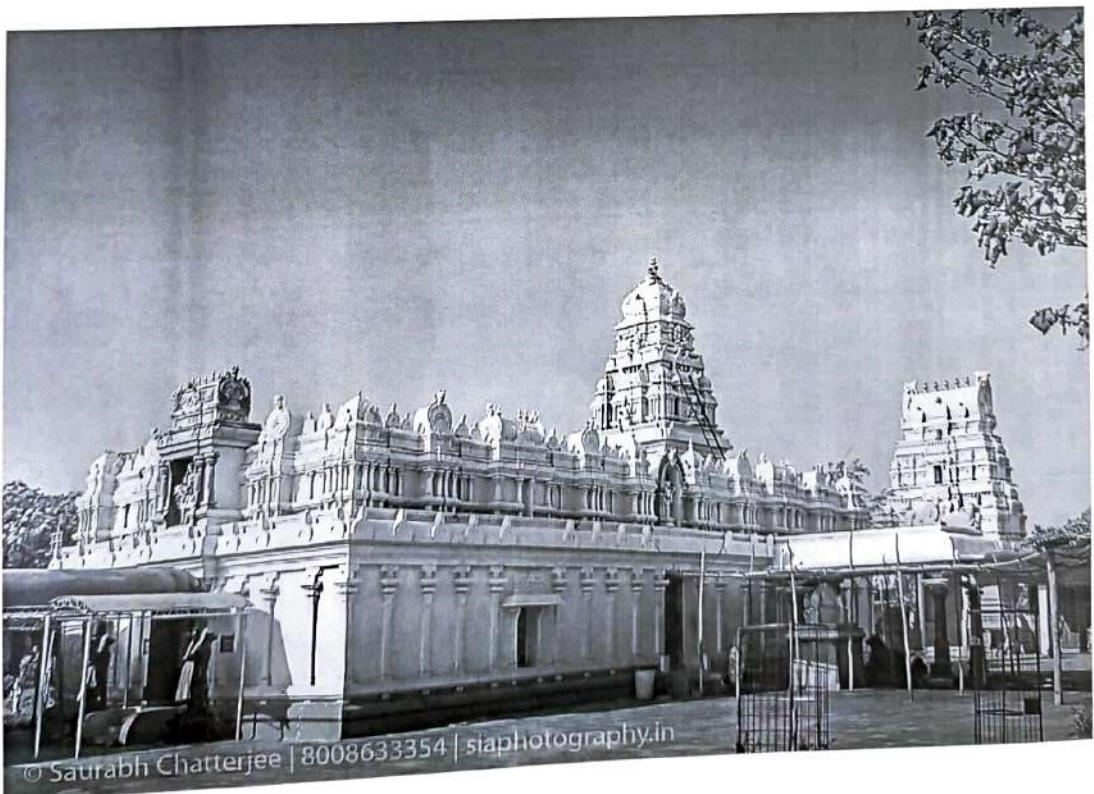
Muktheshwara Swamy temple is the site of the famous shiva temple in Telangana.

- Kaleshwaram Shiva temple is established and built by Rajaiah and Satyawathi Devi Daram. Kaleshwaram river place is also called Dakshina Triveni Sangamam. Confluence to gather Godavari from Telangana and Pranahitha from Maharashtra and the remaining river is Saraswathi which is believed that it flows under those both rivers. Most spiritual place celebrates Maha Shiva Ratri Very Grand Manner.
- Godavari Pushkaralu is an Indian festival celebrated to worship the holy rivers in India. It is observed Once in every 12 years alongside 12 rivers.
- Godavari River in Kaleshwaram draws the massive crowd at the time of Pushkaralu, people from different places in countries visit the sacred rivers and take a bath.
- Kaleshwaram temple one of the famous shiva temple in Telangana many tourists, devotees visit Kaleshwaram temple. Kaleshwaram Temple Income sources of Telangana Government. Kaleshwaram is two lingas on a single pedestal one of the lingas is lord shiva and the other is lord yama, the deity who orders upon the death of mortals and time.

DATA ANALYSIS:

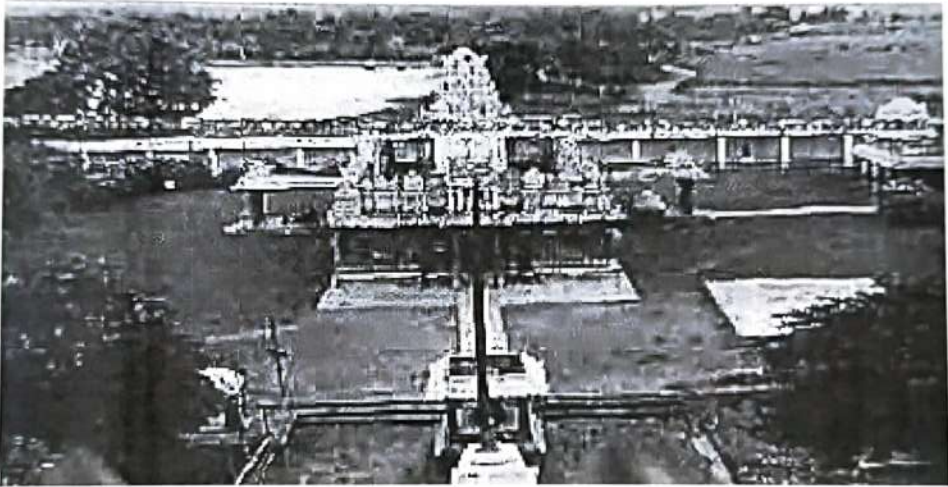
Kaleshwaram is the site of the famous shiva temple called "Kaleshwara Muktheshwara Swamy". Kaleshwaram is located exactly at the merging point of river Pranahita (Tributary of Godavari) and the Godavari River.

Telangana Kaleshwara Mukteshwara Swamy temple is the holy place of dirty Maha Shiva. Most Spiritual place celebrates Maha shiva Ratri very ground manner. KaleshwaraMuktheshwara Swamy temple is one of the famous and ancient temples in Telangana. State Government of Telangana declares Chaya Someshwara Temple and Kaleshwara Temple is ranked first tow famous lord shiva temples in Telangana



THE SPECIALTY OF SHIVA TEMPLE IN KARIMNAGAR:

Kaleshwara shiva temple is the most iconic as fact in this ancient temple is the presence of two Lingams holding on the single pedestal or the Panavattam dual presence of Lord shiva on the Mukteshwara and the temple gets its name Kaleshwara Mukteshwara Swamy Mandiram name. The two shiva lingams on single pedestal or Panavattam gives uniqueness to the temple clear view appearance from side by side, one of the Lingams belongs to Lord shiva (Mukteshwara) and one other belongs to Lord Yama (Kaleshwara).

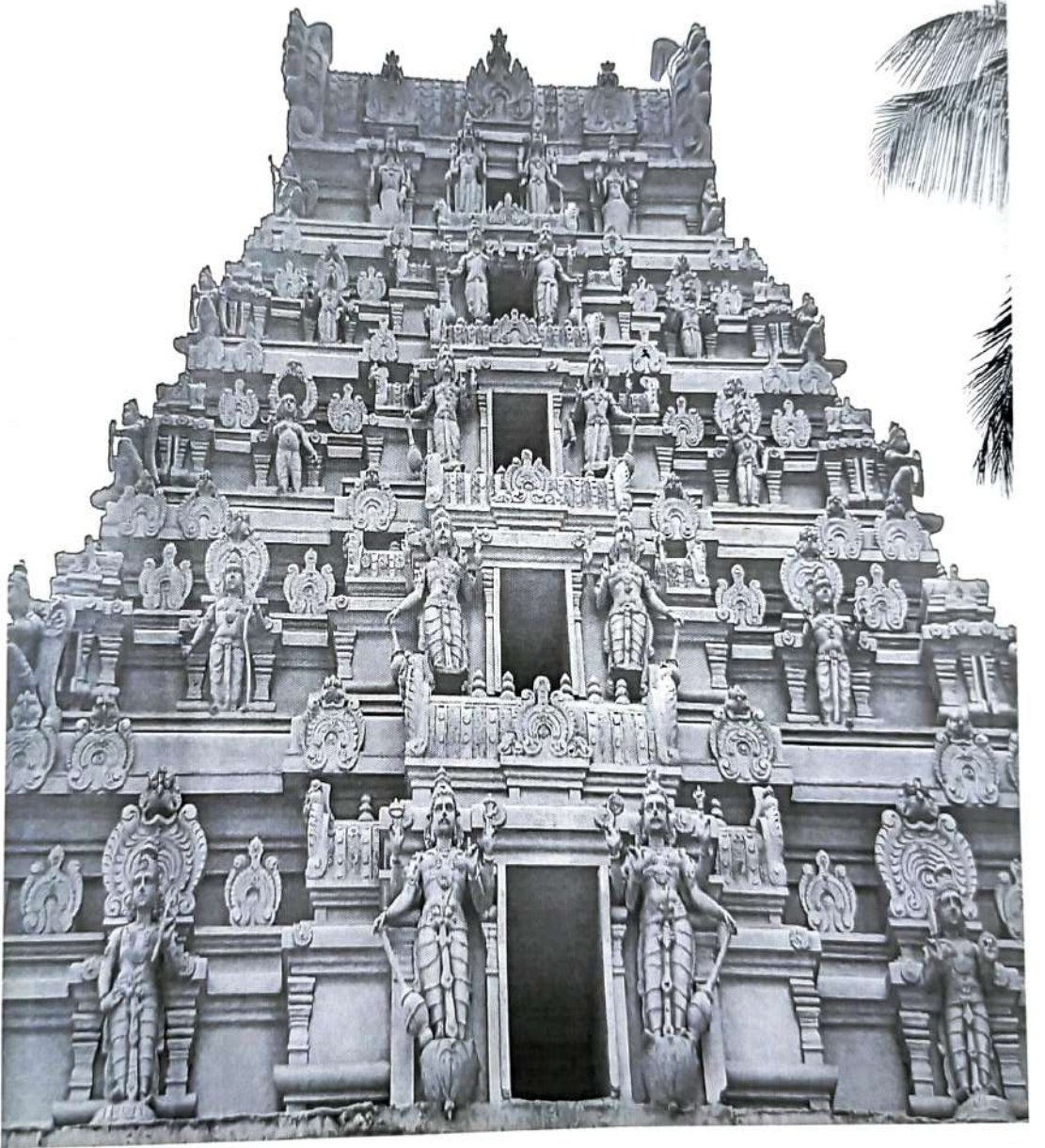


GARBHAGUDI



Kaleshwaram, is one of the places of the three Shiva temples mentioned in Trilinga Darshanam after Darksharama, Srishailam Mallikarjuna Swamy temple it connected to story. Kaleshwaram river place is also called Dakshina Triveni Sangamama as two rivers meet here long with third illusionary flow of Antarvaahini. History speaks about long time back on evia shy has performed abhisheka to KaleshwaraMukteshwara with hundreds of milk pots and the milk beloved at the Sangamam of Godavari and Pranahitha. Hence the name Dakshina Godavari.

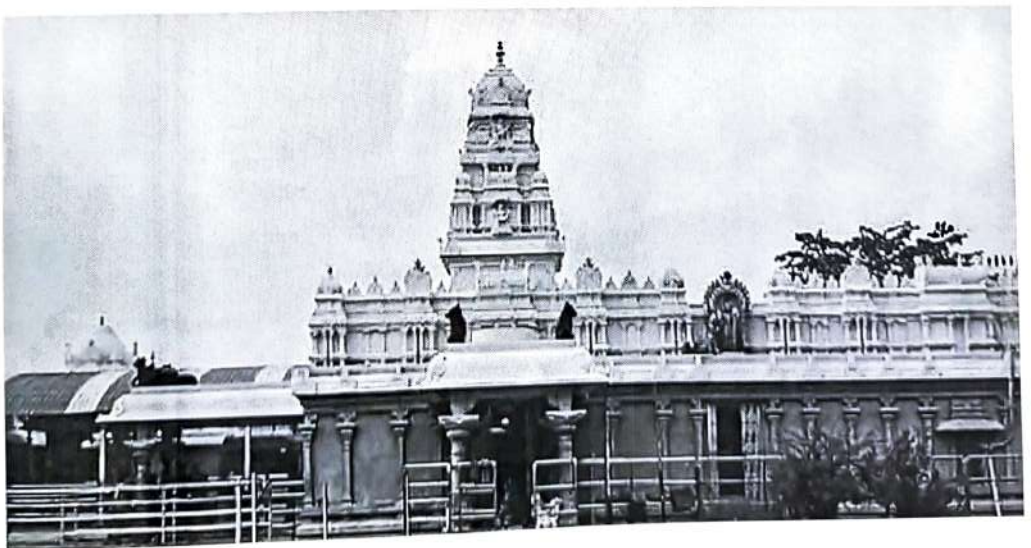
GOPURAM



Sri KaleshwaraMukteshwara Swamy Temple Gopuram.

IMPORTANCE:

The Linga comprises of a Hole that is never full, even when liters of water is poured into it. However, it is assumed that an underground passage leading to the Godavari never allows the hole to be completely full. Still the temple remains a topic for spiritual legends.



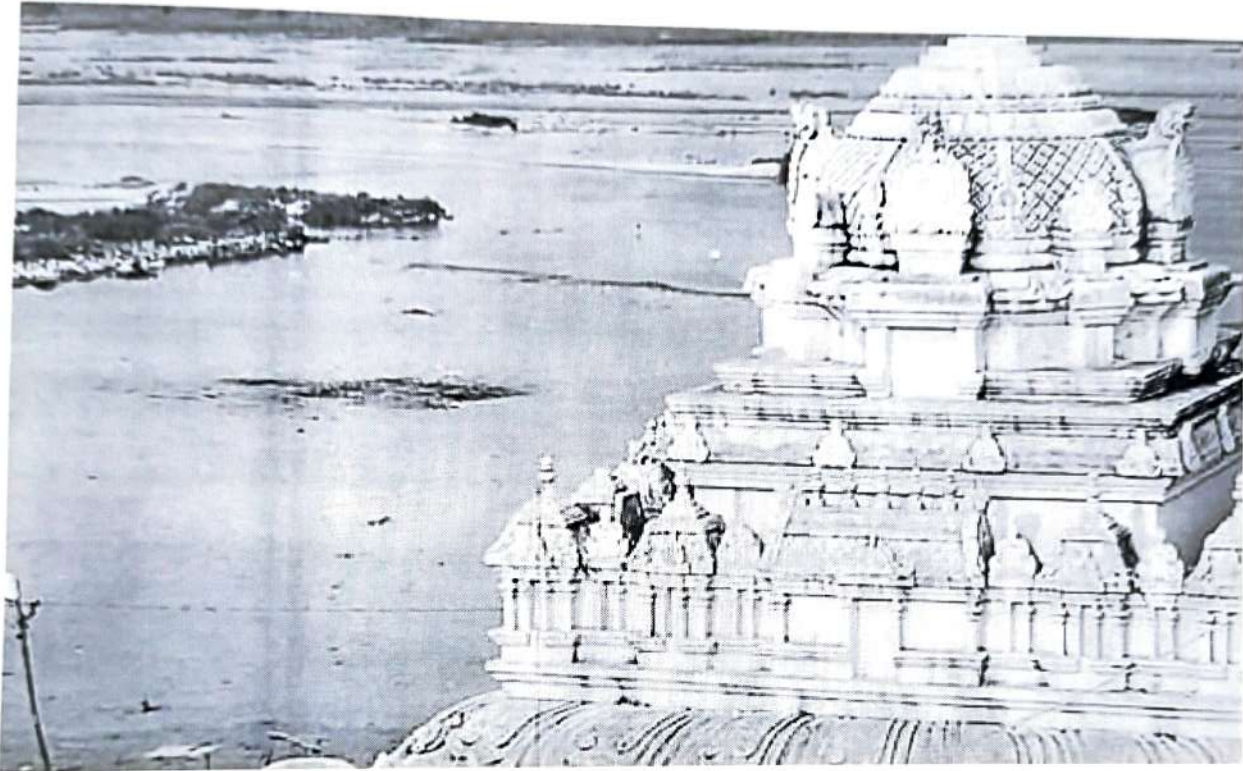
ARCHITECTURE:

Kings of Kakatiya developed many temples in recent years. Telangana state Government investing crores of amount for making many architectural renovations, for beautification, accommodation services, Telangana government spent many crores, to save old architecture of the Kaleshwaram temple. Some of renovated pieces are not touched yet, we can observe entrance of the temple with huge staircase. Temple walls appearance signs of Buddhist rituals and traditions being followed years back. Some inscriptions and sculptures on wall represent Surya, Masya and Brahma, there are also hints of the Kakatiya architecture on the temple walls and other parts of the temple.



GODAVARI PUSHKARALU AT KALESHWARAM TEMPLE:

PUSHKARALU RIVER



Pushkaralu is an Indian festival celebrated to worship the holy rivers in India. It is observed once in every 12 years alongside 12 rivers. People from different places in country visit the sacred rivers and takes aboth. They also perform the Pooja alongside streams Godavari River in Kaleshwaram draws the massive crowd at the time of Pushkaralu.

KALESHWARAM TEMPLE TIMINGS:

- Suprabhatha Seva - Morning 4.30 am to 5.30 am
- Abhishekam- 5.30 am to evening 6.30 pm
- Darshanam- morning 7 am to 12.30 pm
- Ashwatha Shiva Kalyanam-9.30 am to evening 10.30 pm
- Anna Puja and MahaNivedana after noon 12.30 pm to 1.00 p
- DwaraBhandanam (Temple will be closed) 3.30 pm to 6.00
- Pradoshakalu Puja 6.00 pm to 7.30 p.m
- DwaraBhandanam temple will be closed 8.00 p.m

ACCOMMODATION ROOMS BOOKING:

For Rooms booking Accommodation purpose Sri Kaleshwara Mukeshwara Shiva Temple organized free cottage facility, by near way many private lodges rooms available for staying lodges and cottage have been formed from TTD Telangana Government provides Haritha Restaurants and Boarding facility in affordable price range. Kaleshwara Temple also has the well-furnished accommodation rooms available for the devotees.

1. Sri Rajarajeshwara Devasthanam

- Rooms - 1000 Rooms

2. Venkateshwara Cottage

3. Triveni Building

4. Singareni Building

5. TTD Building

SPECIAL POOJAS/ SEVA LIST:

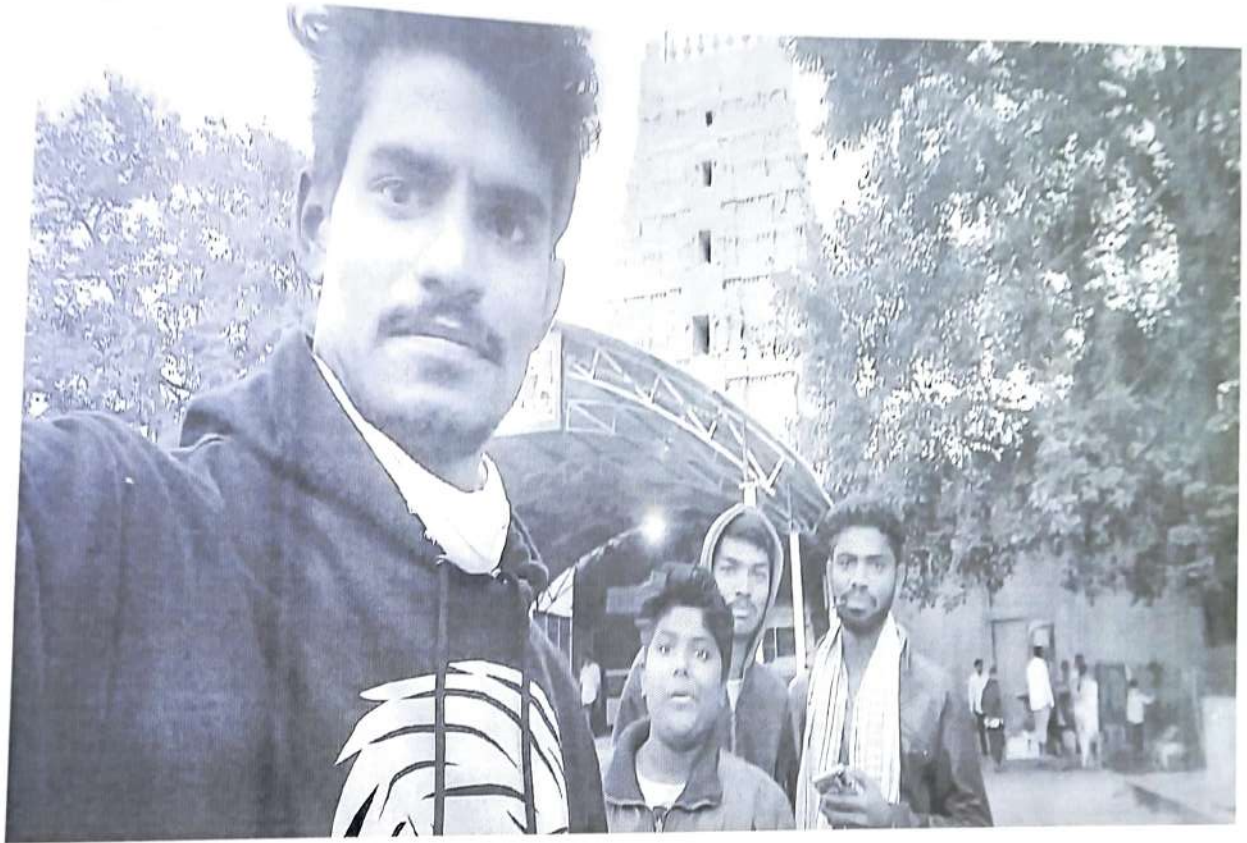
- Shaswatha Nitya Abhishekam
- Shaswatha Nityanna Pooja
- Shaswatha Shiva Kalyanam
- Shaswatha Pooja
- Shaswatha Kunkumarchana

CONCLUSION:

Kaleshwaram River place is also called Dakshina Triveni Sangamam. Confluence a gather Godavari from Telangana and Pranahitha from Maharashtra and the remaining river is Saraswathi which is believed that it flows under those both rivers.

Most spiritual place celebrates Mahashivaratri very grand manner and Godavari Pushkaralu Kaleshwaram temple in Indian festival celebrated to worship the holy rivers in India. So many people from different places in country visit the sacred rivers and take both they also perform the pooja alongside stream Godavari River in Kaleshwaram draws the massive ground if the time to Pushkaralu, Kaleshwaram is one of the best famous temples in Telangana so many tourists and devotees visit Kaleshwaram temple & Project.

So, Telangana Government economically income sources Kaleshwaram temple.



REFERNCES:

- Newspaper Articles
- Student Fieldwork
- Books

GOVERNMENT DEGREE COLLEGE, BHUPALPALLY
JAYASHANKAR DISTRICT -506169



DEPARTMENT OF MATHEMATICS
STUDENT STUDY PROJECT

2020-21

TITLE: DIFFERENT METHODS TO FIND SOLUTIONS OF
GIVEN DIFFERENTIAL EQUATIONS

Certified that this is a bonafiede work done by the following B.SC (MPCs) I year students of this college in the subject
MATHEMATICS

NAME OF THE STUDENTS:

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2. R. NAVYA R. NAVYA
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Government Model Degree

College - Bhupalpally

Students Project - 2020-21

TOPIC: Different methods to find solutions of given Differential Equations

Names: 1. Y. Sravani (B.Sc MPCs Ist year)

2. R. Navya (")

3. B. Ashwilkā (")

4. S. Roopa (")

Group : B.Sc (MPCs)

OBJECTIVES:-

After completing the project student can solve the differential Equations by from the following methods.

- (1) Homogeneous method
- (2) Non homogeneous method.
- (3) Linear differential Equations.
- (4) Bernoulli's Equations.
- (5) Exact Differential Equations
- (6) Non Exact Differential Equations
- (7) Method of Variation of parameters
- (8) Linear differential Equations with Non constant coefficients.
- (9) partial differential Equation formation and solution.
- (10) Differential Equations of first order but not of first degree.

Introduction - Equations In Which Variables Are Separable

Variable Separable Form:

An equation which separates x, dx and y, dy terms of a differential equation is referred to as variable separable form.

Example:

The variable separable form of a differential equation of first order degree $\frac{dy}{dx} = f(x, y)$ is,

$$p(x) \cdot dx + q(y) \cdot dy = 0$$

The general solution of this form is obtained by integrating the terms and adding an additional arbitrary constant to the variable separable form.

$$\text{i.e., } \int p(x) dx + \int q(y) dy = c$$

variable separable form of an equation can also be obtained by substitution method.

Homogeneous Differential Equations

Homogeneous Equation

A differential equation of the form $\frac{dy}{dx} = \frac{f_1(x, y)}{f_2(x, y)}$ is said to be homogeneous, if the functions $f_1(x, y)$ and $f_2(x, y)$ are the homogeneous expressions in x and y with same degree.

$$\text{Example: } \frac{dy}{dx} = \frac{2x^2 - y^2}{x^2 + y^2}$$

Solution of a Homogeneous Differential Equation

Generally, homogeneous differential equations are solved by transposing the 'y' term of the equation.

This transformation also changes the entire equation into variable separable form, which simplifies the solving procedure. Thus, solution is obtained by retransforming the solution into its original variable.

Example

Let a homogeneous differential equation of first order and first degree be expressed as,

$$\frac{dy}{dx} = \frac{f_1(x, y)}{f_2(x, y)} \quad - (1)$$

The variable 'y' in equation (1) can be transformed as,

$$y = vx \quad - (2)$$

Differentiating equation (2) with respect to 'x',

$$\frac{dy}{dx} = v + x \cdot \frac{dv}{dx} \quad - (3)$$

Substituting equation (3) in equation (1),

$$v + x \cdot \frac{dv}{dx} = \frac{f_1(x, y)}{f_2(x, y)}$$

As 'y' is transformed in terms of 'v',

$$v + x \cdot \frac{dv}{dx} = F(v)$$

$$x \cdot \frac{dv}{dx} = F(v) - v$$

$$\frac{dv}{F(v) - v} = \frac{dx}{x}$$

Hence, a variable separable form of differential equation is obtained

Differential Equations Reducible To Homogeneous Form

The differential equation of the form,

$$\frac{dy}{dx} = \frac{ax+by+c}{a'x+b'y+c'} \quad - (1)$$

where, a, b, c, a', b' and c' are real numbers.

Equation (1) is called non-homogeneous differential equation of first degree.

It can be reduced to homogeneous differential equations as follows:

Case 1

$$\text{If } \frac{a}{a'} \neq \frac{b}{b'}$$

Substitute $x = X+h$, $y = Y+k$

where, X and Y are variables and h and k are constant.

$$\text{Then } dx = dX, \quad dy = dY$$

Substituting the corresponding values in equation (1),

$$\frac{dY}{dX} = \frac{aX+ah+bY+bk+c}{a'X+a'h+b'Y+b'k+c'} \quad - (2)$$

$$\frac{dY}{dX} = \frac{aX+bY+(ah+bk+c)}{a'X+b'Y+(a'h+b'k+c')} \quad - (2)$$

The values of h, k can be obtained by solving equations

$$ah+bk+c=0 \quad \text{and}$$

$$a'h+b'k+c'=0$$

Then equation (2) becomes homogeneous differential equation of the form

$$\frac{dy}{dx} = \frac{ax + by}{a'x + b'y}$$

It can be solved by substituting $y = vx$ and integrating.

Case a

$$\text{If } \frac{a}{a'} = \frac{b}{b'} = \frac{1}{t}$$

$$\Rightarrow a' = at, b' = bt$$

Then,

$$\frac{dy}{dx} = \frac{ax + by + c}{t(ax + by) + c'} \quad - (3)$$

$$\text{Substituting } ax + by = v \quad - (4)$$

Differentiating equation (4) with respect to 'x',

$$a + b \frac{dy}{dx} = \frac{dv}{dx}$$

$$\Rightarrow \frac{dy}{dx} = \frac{1}{b} \left[\frac{dv}{dx} - a \right] \quad - (5)$$

Substituting equation (4) and (5) in equation (3),

$$\frac{1}{b} \left[\frac{dv}{dx} - a \right] = \frac{v + c}{tv + c'}$$

$$\Rightarrow \frac{dv}{dx} = a + \frac{b(v + c)}{tv + c'}$$

Applying variable separable method and integrating to get the required solution.

Linear Differential Equations - Differential Equations Reducible To Linear Form

Linear Differential Equation:

A differential equation of the form $\frac{dy}{dx} + Py = Q$ (where P, Q are functions of x or constant) is said to be linear, if the dependent variable and its derivatives are of first degree.

Example:

$$\frac{dy}{dx} + 2y \tan x = \sin x$$

The general solution of linear differential equation is obtained as,

$$y \times (I.F) = \int Q \times (I.F) dx + C$$

where,

$$\text{Integrating factor (I.F)} = e^{\int P dx}$$

Procedure:

The sequence of steps involved in determining linear equations are,

Step 1: The first step is to write the given equation in the form $\frac{dy}{dx} + Py = Q$

Step 2: In second step, the functions P and Q are identified.

Step 3: The next step is to evaluate the integrating factor

$$\text{i.e., } I.F = e^{\int P dx}$$

Step 4: Final step is to determine the general solution using the formula,

$$y \times (I.F) = \int Q \times (I.F) dx + C$$

Bernoulli's Equation

If P and Q are the functions of a variable ' x ', then the Bernoulli's equation in y is defined as,

$$\frac{dy}{dx} + Py = Qy^n$$

The steps involved in solving a Bernoulli's equation are,

i) Initially, the given differential equation should be converted into the standard form of Bernoulli's equation.

$$\text{i.e., } \frac{dy}{dx} + Py = Qy^n$$

ii) The second step is to divide the entire equation by y^n to obtain an equation of the form, $y^{-n} \frac{dy}{dx} + Py^{1-n} = Q$

iii) The next step is to replace y^{1-n} by t and solve to obtain a linear equation in t .

iv) Finally, replace t by y^{1-n} in the solution obtained in step (iii) to achieve the desired solution.

Exact Differential Equations

Exact Differential Equation:-

An equation of the form $Mdx + Ndy = 0$ (where M and N are functions of x and y) is said to be exact differential equation if,

$$\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$$

Example

$$(x^2 + y)dx + (y^2 + x)dy = 0$$

The general solution of this form is obtained as,

$$\int m dx + \int n dy = c$$

(y constant) (terms independent of x)

Procedure

The sequence of steps involved in determining an exact differential equation are:

Step 1: First step is to write the given equation in the form $m dx + n dy = 0$

Step 2: In this step, the differential equation is tested for exactness.

$$\text{i.e., } \frac{\partial m}{\partial y} = \frac{\partial n}{\partial x}$$

Step 3: The final step is to determine the general solution using the formula,

$$\int m dx + \int n dy = c$$

(y constant) (terms independent of x)

Integrating Factors

A function $F(x, y)$ which can make a non-exact differential equation of the type $M(x, y)dx + N(x, y)dy = 0$ exact is called the integrating factor of the differential equation.

Rules for Finding Integrating Factors of the Equation

$$Mdx + Ndy = 0$$

* Integrating Factor Found by Inspection

In many cases, the integrating factor can be determined by regrouping of terms and recognizing each group as a part of an exact differential equation. The important useful differentials are,

$$d(xy) = xdy + ydx$$

$$d\left(\frac{y}{x}\right) = \frac{xdy - ydx}{x^2}$$

$$d\left[\log\left(\frac{y}{x}\right)\right] = \frac{xdy - ydx}{xy}$$

$$-d\left(\frac{x}{y}\right) = \frac{xdy - ydx}{y^2}$$

$$d\left[\tan^{-1}\frac{y}{x}\right] = \frac{xdy - ydx}{x^2 + y^2}$$

$$d\left[\frac{1}{2} \log(x^2 + y^2)\right] = \frac{xdx + ydy}{x^2 + y^2}$$

* Integrating Factor of a Homogeneous Equation

If $M(x, y)dx + N(x, y)dy = 0$ represents a homogeneous equation and $mx + ny \neq 0$, then the integrating factor of $Mdx + Ndy = 0$ is, $\frac{1}{mx + ny}$

* Integrating Factor for an Equation of the Type

$$f_1(xy)ydx + f_2(xy)x dy = 0$$

If differential equation $Mdx + Ndy = 0$ is of the form $y f_1(xy)dx + x f_2(xy)dy = 0$ and $Mx - Ny \neq 0$, then integrating factor is given as, $I.F = \frac{1}{Mx - Ny}$

* Integrating factor of $Mdx + Ndy = 0$

case (i)

$$\text{If } \frac{1}{N} \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right) = f(x) \quad (\text{i.e. function of } x)$$

then,

$$\text{I.F} = e^{\int f(x) dx}$$

case (ii)

$$\text{If } \frac{1}{M} \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y} \right) = g(y) \quad (\text{i.e. function of } y)$$

then,

$$\text{I.F} = e^{\int g(y) dy}$$

* Integrating factor of $x^a y^b (mydx + nx dy) + x^c y^d (pydx + qx dy) = 0$

For the equation $x^a y^b (mydx + nx dy) + x^c y^d (pydx + qx dy) = 0$

where a, b, c, d, m, n, p and q are constants, then $x^h y^k$ is the integrating factor, where h, k are constants.

Change In Variables

Given differential equation is,

$$\sec^2 y \left(\frac{dy}{dx} \right) + 2x \tan y = x^3 \quad - (1)$$

Let, $\tan y = v$

$$\sec^2 y \frac{dy}{dx} = \frac{dv}{dx} \quad - (2)$$

Substituting the corresponding values in equation (1),

$$\frac{dv}{dx} + 2x.v = x^3 \quad - (2)$$

Equation (2) is a linear differential equation of the form,

$$\frac{dy}{dx} + P(y) = Q(x)$$

$$\text{I.F} = e^{\int 2x dx} = e^{\frac{2x^2}{2}} = e^{x^2}$$

∴ The general solution is,

$$v(e^{x^2}) = \int x^3 \cdot e^{x^2} dx + c$$

$$\text{Let, } x^2 = t, \Rightarrow 2x dx = dt$$

$$\therefore v e^{x^2} = \int t \cdot e^t \cdot \frac{1}{2} dt + c$$

$$v e^{x^2} = \frac{1}{2} (t-1) e^t + c$$

$$v e^{x^2} = \frac{1}{2} (x^2-1) e^{x^2} + c$$

$$v = \frac{1}{2} (x^2-1) + c e^{-x^2}$$

$$\therefore \tan y = \frac{1}{2} (x^2-1) + c e^{-x^2}$$

Total Differential Equations

Given differential equation is,

$$(yz + 2x)dx + (zx + 2y)dy + (xy + 2z)dz = 0 \quad - (1)$$

Its auxiliary equation is, $Pdx + Qdy + Rdz = 0$

where,

$$P = yz + 2x, \quad Q = zx + 2y, \quad R = xy + 2z$$

The condition for exactness is,

$$R \left(\frac{\partial P}{\partial y} - \frac{\partial Q}{\partial x} \right) + P \left(\frac{\partial Q}{\partial z} - \frac{\partial R}{\partial y} \right) + Q \left(\frac{\partial R}{\partial x} - \frac{\partial P}{\partial z} \right) = 0$$

$$= (xy + 2z) \left(\frac{\partial}{\partial y} (yz + 2x) - \frac{\partial}{\partial x} (zx + 2y) \right) + (yz + 2x) \left(\frac{\partial}{\partial z} (zx + 2y) - \frac{\partial}{\partial y} (xy + 2z) \right)$$

$$+ (zx + 2y) \left(\frac{\partial}{\partial x} (xy + 2z) - \frac{\partial}{\partial z} (yz + 2x) \right)$$

$$= (xy + 2z)(z - z) + (yz - 2x)(x - x) + (zx + 2y)(y - y)$$

$$= 0$$

Hence, the condition for exactness is satisfied
Equation (1) can be written as,

$$yzdx + 2xdx + zxdy + 2ydy + xydz + 2zdz = 0$$

$$\Rightarrow yzdx + zxdy + xydz + 2xdx + 2ydy + 2zdz = 0$$

$$\Rightarrow d(xyz) + 2(xdx + ydy + zdz) = 0$$

Integrating on both sides,

$$\int d(xyz) + 2 \int (xdx + ydy + zdz) = C$$

$$\Rightarrow xyz + 2 \left[\frac{x^2}{2} + \frac{y^2}{2} + \frac{z^2}{2} \right] = C$$

$\therefore xyz + x^2 + y^2 + z^2 = C$ is the required solution.

Simultaneous Total Differential Equations -

Equations of the form $\frac{dx}{p} = \frac{dy}{q} = \frac{dz}{r}$

Given differential equation is,

$$\frac{dx}{y^2} = \frac{dy}{x^2} = \frac{dz}{x^2 y^2 z^2}$$

Equating first two fractions,

$$\frac{dx}{y^2} = \frac{dy}{x^2}$$

$$\Rightarrow x^2 dx = y^2 dy$$

Integrating on both sides

$$\int x^2 dx = \int y^2 dy$$

$$\Rightarrow \frac{x^3}{3} = \frac{y^3}{3} + C_1$$

$$\Rightarrow x^3 - y^3 = 3C_1$$

Evaluating last two products,

$$\frac{dy}{x^2} = \frac{dz}{x^2 y^2 z^2}$$

$$\Rightarrow y^2 dy = z^{-2} dz$$

Integrating on both sides

$$\int y^2 dy = \int z^{-2} dz$$

$$\Rightarrow \frac{y^3}{3} = \frac{-1}{z} + c_2$$

$$\Rightarrow \frac{y^3}{3} + \frac{1}{z} = c_2$$

$$\Rightarrow zy^3 + 3 = 3c_2$$

\therefore The required solution is, $x^3 - y^3 = 3c_1$, $zy^3 + 3 = 3zc_2$

Solution of Homogeneous Linear Differential
Solve $\frac{d^2 y}{dx^2} + (a+b) \frac{dy}{dx} + aby = 0$ Equation

Given differential equation is

$$\frac{d^2 y}{dx^2} + (a+b) \frac{dy}{dx} + aby = 0$$

The given equation can be written in symbolic

$$(D^2 + (a+b)D + ab)y = 0$$

Eqn (1) is a homogeneous linear differential equation of the form

$$P(D)y = 0$$

Comparing equation (2) with equation (1)

$$P(D) = D^2 + (a+b)D + ab$$

Auxiliary equation is, $P(m) = 0$

$$m^2 + (a+b)m + ab = 0$$

$$\Rightarrow m^2 + am + bm + ab = 0$$

$$\Rightarrow m(m+a) + b(m+a) = 0$$

$$(m+a)(m+b) = 0$$

$$\therefore m_1 = -a, m_2 = -b$$

Roots are real and distinct

Hence, the complementary function is

$$\begin{aligned} C.F. &= c_1 e^{m_1 x} + c_2 e^{m_2 x} \\ &= c_1 e^{-ax} + c_2 e^{-bx} \end{aligned}$$

\therefore General solution of homogeneous linear differential equation is

$$y = C.F = c_1 e^{-ax} + c_2 e^{-bx}$$

SOLUTION OF NON-HOMOGENEOUS DIFFERENTIAL EQUATIONS $P(D)y = Q(x)$ WITH CONSTANT COEFFICIENTS BY MEANS OF POLYNOMIAL OPERATORS WHEN

$$Q(x) = be^{ax}, b \sin ax, b \cos ax, bx^k, Ve^{ax}$$

A LINEAR differential equation of the form

$$a_0 \frac{d^n y}{dx^n} + a_1 \frac{d^{n-1} y}{dx^{n-1}} + \dots + a_n y = x$$

where, the right hand side (R.H.S) of the equation is non-zero, is known as n^{th} -order non-homogeneous differential equation

The symbolic form of equation (1) is

$$(a_0 D^n + a_1 D^{n-1} + \dots + a_n) y = x$$

$$F(D)y = x$$

where,

$P(D)$ = Polynomial of n^{th} order

x = function of the form $k, e^{ax}, \sin ax, \cos ax, x^m$

The general solution of an n^{th} order non-homogeneous differential equation is,

General solution = complementary function + particular integral

$$y = C.F + P.I$$

Where,

$$P.I = \frac{\lambda}{f(D)}$$

and $\lambda = k, e^{ax}, \sin ax, \cos ax, \cos ax, x^m$

depending on the type of λ , the different particular integrals can be obtained as,

no	Function type (λ)	particular integral (P.I)
1	(a) $e^{ax}, f(a) \neq 0$	$P.I = \frac{1}{f(D)} \cdot e^{ax}$ <p>Put $D = a$ in $f(D)$</p> $P.I = \frac{1}{f(a)} \cdot e^{ax}$
2	(b) $e^{ax}; f(a) = 0$	$P.I = \frac{1}{(D-a)^n} \cdot e^{ax}$ $P.I = \frac{x^n}{n!} \cdot e^{ax}$

$$1) e^{ax}, f(0) = 0$$

$$P.I = \frac{1}{f(D)} \cdot e^{ax}$$

$$= \frac{1}{(D-a)^r g(D)} \cdot e^{ax}$$

$$= \frac{1}{g(a)} \cdot \frac{1}{(D-a)^r} \cdot e^{ax}$$

$$P.I = \frac{1}{g(a)} \cdot \frac{x^r}{r!} \cdot e^{ax}; g(a) \neq 0$$

$$2 \text{ Constant} = k = k \cdot e^{0x}$$

$$P.I = \frac{1}{f(D)} \cdot k$$

$$\text{Put } D=0 \text{ in } f(D) = \frac{k \cdot e^{0x}}{f(D)}$$

$$P.I = \frac{k}{f(0)}; f(0) \neq 0$$

$$3 \text{ (a) } \sin ax; \text{ For } f(-a^2) \neq 0$$

$$P.I = \frac{1}{f(D^2)} \sin ax$$

$$\text{Put } D^2 = -a^2$$

$$P.I = \frac{1}{f(-a^2)} \sin ax$$

$$b \sin ax; f(-a^2) = 0$$

$$P.I = \frac{1}{D^2 + a^2} \sin ax$$

$$P.I = \frac{-x}{2a} \cos(ax); a \neq 0$$

$$c \cos ax; f(-a^2) \neq 0$$

$$P.I = \frac{1}{f(D^2)} \cos ax$$

$$\text{Put } D^2 = -a^2$$

$$P.I = \frac{1}{f(-a^2)} \cos ax$$

(d)	$\cos ax; x(1-a^2)=0$	$P.I = \frac{1}{b^2+a^2} \cos ax$ $= \frac{x}{2a} \sin ax; a \neq 0$
+	x^m	$P.I = \frac{1}{f(D)} x^m$ $= [f(D)]^{-1} x^m$ <p>where</p> <p>$[f(D)]^{-1}$ is expanded in ascending powers of D, by converting it into form $[1 \pm g(D)]^{-1}$</p>

Write the solution of n^{th} order differential equations of the type $x(D)y = Q(x)$ by using method of undetermined coefficients.

A non-homogeneous linear differential equation of n^{th} order is represented as,

$$a_0 \frac{d^n y}{dx^n} + a_1 \frac{d^{n-1} y}{dx^{n-1}} + \dots + a_n y = Q(x)$$

where, $a_0 \neq 0$ and $Q(x) \neq 0$

The symbolic form of equation (1) is

$$(a_0 D^n + a_1 D^{n-1} + a_2 D^{n-2} + \dots + a_n)y = Q(x)$$

$$f(D)y = Q(x)$$

where,

$P(D)$ - polynomial of n th order

$Q(x)$ - function the form $k, e^{ax}, \sin ax, \cos ax$

x^m, e^{ax}, v

The solution of an n th order non-homogeneous differential equation is given by,

General solution = complementary

function + particular integral

$$\text{i.e. } y = y_c + y_p$$

where,

$$P(D)y = P(D)y_p$$

depending on the type of $Q(x)$ term,

the different particular integrals can be obtained as,

S.No	Function type $Q(x)$	Particular Integral (y)
1	$\sin ax$	$y_p = A \sin ax + B \cos ax$
2	$\cos ax$	$y_p = A \cos ax + B \sin ax$
3	$x^n, \text{ if } m \neq 0;$	$y_p = Ax^n + Bx^{n-1} + \dots + Nx^0$
4	$x^n, \text{ if } m=0 \text{ with multiplicity 'r' ;}$	$y_p = x^r (Ax^n + Bx^{n-1} + \dots + Nx^0)$
5	e^{ax}	$y_p = A e^{ax}$
6	$e^{ax}, \text{ if } Q(x) \text{ contains } e^{ax} \text{ term which is } x^k \text{ times the same term in } y_c;$	$y_p = x^{k+1} \cdot e^{ax}$ neglect the term e^{ax} in y_p .
7	$e^{ax}, \text{ if } Q(x) \text{ contains } e^{ax} \text{ term which is } x^k \text{ times the same term in } y_c \text{ with a multiple root 'm' of multiplicity 'r'}$	$y_p = x^{k+r} \cdot e^{ax}$ neglect the term e^{ax} and $x e^{ax}$ in y_p .

METHOD OF VARIATION OF PARAMETERS

The particular integral of a second order differential equation using method of variation of parameters.

A Second Order linear differential equation with constant coefficients is expressed as,

$$a_2 \frac{d^2 y}{dx^2} + a_1 \frac{dy}{dx} + a_0(y) = Q(x) \quad \text{--- (1)}$$

where, a_0, a_1, a_2 are constant co-efficient
 $Q(x)$ is a continuous function of x .
 $Q(x) \neq 0$ and $a_2 \neq 0$

The homogeneous equation related to equation (1) is

$$a_2 \frac{d^2 y}{dx^2} + a_1 \frac{dy}{dx} + a_0 y = 0 \quad \text{--- (2)}$$

Let y_1 and y_2 be the two linearly independent solutions of equation (2) such that

$$y_p(x) = u(x)y_1(x) + v(x)y_2(x) \quad \text{--- (3)}$$

where

$u(x), v(x)$ are function of x that are to be determined

y_p is the particular integral of equation (1).

Differentiating equation (3) with respect to 'x'.

$$\frac{dy_p}{dx} = u \frac{dy_1}{dx} + \frac{du}{dx} y_1 + v \frac{dy_2}{dx} + \frac{dv}{dx} y_2$$

$$\Rightarrow y_p' = uy_1' + u'y_1 + vy_2' + v'y_2$$

$$\Rightarrow y_p' = [(uy_1') + (vy_2')] + [(u'y_1) + (v'y_2)] \quad \text{--- (4)}$$

Differentiating equation (4) with respect to 'x',

$$y_p'' = uy_1'' + u'y_1' + vy_2'' + v'y_2' + u''y_1 + u'y_1' + v''y_2 + v'y_2' \quad \text{--- (5)}$$

Equation (1) can also be written as

$$a_2 y_p'' + a_1 y_p' + a_0 y_p = Q(x) \quad \text{--- (6)}$$

Substituting equations (3), (4) and (5) in equation (6)

$$\begin{aligned} & a_2 [uy_1'' + u'y_1' + vy_2'' + v'y_2' + u''y_1 + u'y_1' + v''y_2 + v'y_2'] \\ & + a_1 [uy_1' + vy_2' + u'y_1 + v'y_2] + a_0 [uy_1 + vy_2] = Q(x) \quad \text{---} \\ \Rightarrow & u[a_2 y_1'' + a_1 y_1' + a_0 y_1] + v[a_2 y_2'' + a_1 y_2' + a_0 y_2] + a_2 [u'y_1' + v'y_2'] \\ & + a_1 [u'y_1 + v'y_2] = Q(x) \quad \text{--- (7)} \end{aligned}$$

Since, y_1 and y_2 are the solutions of equation (2), the first two parameters in equation (7) becomes zero

$$\therefore a_2 (u'y_1' + v'y_2') + a_1 (u'y_1 + v'y_2) = Q(x) \quad \text{--- (8)}$$

Equation (8) is satisfied if the two variables u and v are taken such that

$$u'y_1 + v'y_2 = 0 \text{ and}$$

$$u'y_1' + v'y_2' = \frac{Q(x)}{a_2} \quad \text{--- (9)}$$

The solution of equation (9) can be obtained as,

$$u' = \frac{\begin{vmatrix} 0 & y_2 \\ \frac{Q(x)}{a_2} & y_2' \end{vmatrix}}{\begin{vmatrix} y_1 & y_2 \\ y_1' & y_2' \end{vmatrix}} \quad \text{and}$$

$$v' = \frac{\begin{vmatrix} y_1 & 0 \\ y_1' & \frac{Q(x)}{a_2} \end{vmatrix}}{\begin{vmatrix} y_1 & y_2 \\ y_1' & y_2' \end{vmatrix}}$$

(10)

where $\begin{vmatrix} y_1 & y_2 \\ y_1' & y_2' \end{vmatrix}$ is the wronskian of the set $\{y_1, y_2\}$.

If $y_1 y_2' - y_2 y_1' = 0$, then $Q(x)$ is linearly dependent

If $y_1 y_2' - y_2 y_1' \neq 0$, then $Q(x)$ is linearly independent function

Integrating equation (10); we get u and v values and

Substituting the values in equation (3), we get the

particular integral of equation (1)

LINEAR DIFFERENTIAL EQUATION WITH NON CONSTANT COEFFICIENTS

Solve $y'' - \frac{2}{x} y' + \frac{2}{x^2} y = 0$, $y_1 = x$.

differential equation is,

$$y'' - \frac{2}{x} y' + \frac{2}{x^2} y = 0; y_1 = x$$

$$f_1(x) = \text{coefficient of } y' = -\frac{2}{x}$$

$$f_2(x) = \text{coefficient of } y'' = 1$$

$$u = \frac{\exp\left[-\int \frac{f_1(x)}{f_2(x)} dx\right]}{y_1^2}$$

$$\Rightarrow u = \frac{\exp\left[-\int \frac{-\frac{2}{x}}{1} dx\right]}{x^3}$$

$$= \frac{\exp\left[2 \int \frac{1}{x} dx\right]}{x^3}$$

$$= \frac{\exp[2 \log x]}{x^3}$$

$$= \frac{\exp(\log x^2)}{x^3} = \frac{x^2}{x^3} = \frac{1}{x}$$

$$\therefore y_2 = y_1 \int u dx = x \int \frac{1}{x} dx = x(x) = x^2$$

The required solution is $y = y_1 C_1 + y_2 C_2$ i.e. $y = C_1 x + C_2 x^2$

THE CAUCHY - EULER EQUATION

Short Notes on Cauchy - Euler equation

The second order Cauchy - Euler equation is given by,

$$a_2 x^2 \frac{d^2 y}{dx^2} + a_1 x \frac{dy}{dx} + a_0 y = Q(x) \quad \text{--- (1)}$$

where a_2, a_1, a_0 are constant.

let $x = e^t$ --- (2)

Applying logarithm on both sides

$$\log x = \log e^t$$

$$[\because \log_e e = 1]$$

$$\Rightarrow \log x = t$$

from equation (2), $x = e^t$

$$\Rightarrow dx = e^t dt$$

$$\Rightarrow \frac{dt}{dx} = \frac{1}{e^t}$$

$$\Rightarrow \frac{dt}{dx} = \frac{1}{x} \quad \text{--- (3)}$$

The $\frac{dy}{dx} = \frac{dt}{dx} \cdot \frac{dy}{dt}$

$$\frac{dy}{dx} = \frac{1}{x} \left(\frac{dy}{dt} \right) \quad \text{--- (4)}$$

$$x \frac{dy}{dx} = \frac{dy}{dt} \quad \text{--- (5)}$$

Differentiating equation (5) with respect to 'x',

$$x \frac{d^2 y}{dx^2} + \frac{dy}{dx} = \frac{d}{dx} \left(\frac{dy}{dt} \right)$$

Multiplying on both sides by x ,

$$x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} = x \frac{d}{dt} \left(\frac{dy}{dx} \right)$$

$$= x \frac{d}{dt} \left[\frac{1}{x} \frac{dy}{dt} \right] \quad [\text{From eqn (5)}]$$

$$\Rightarrow x^2 \frac{d^2 y}{dx^2} + \frac{dy}{dt} = \frac{d^2 y}{dt^2}$$

$$\therefore x^2 \frac{d^2 y}{dx^2} = \frac{d^2 y}{dt^2} - \frac{dy}{dt} \quad \text{--- (6)}$$

Substituting equation (5), (5) and (6) in equation (1),

$$a_2 \left[\frac{d^2 y}{dt^2} - \frac{dy}{dt} \right] + a_1 \frac{dy}{dt} + a_0 y = Q(e^t)$$

$$\Rightarrow a_2 \frac{d^2 y}{dt^2} + (a_1 - a_2) \frac{dy}{dt} + a_0 y = Q(e^t)$$

The solution of above equation is $y = y_c + y_p$

LEGENDRE'S LINEAR EQUATION

The solution of n^{th} Order Legendre's equation.

The n^{th} Order Legendre's equation is given by,

$$(ax+b)^n \frac{d^n y}{dx^n} + k_1 (ax+b)^{n-1} \frac{d^{n-1} y}{dx^{n-1}} + \dots + k_n y = 0 \quad \text{--- (1)}$$

where k_0, k_1, \dots, k_n are constants

$$\text{let } ax+b = ez \quad \text{--- (2)}$$

Applying logarithm on both sides

$$\log(ax+b) = \log e^z$$

$$\Rightarrow \log(ax+b) = z \log e$$

$$\Rightarrow \log(ax+b) = z$$

From equation (2),

$$ax+b = e^z$$

Differentiating on both sides

$$a dx = e^z dz$$

$$\Rightarrow \frac{dz}{dx} = \frac{a}{ax+b}$$

$$\Rightarrow \frac{dz}{dx} = \frac{a}{ax+b} \quad \text{--- (3)}$$

Then, $\frac{dy}{dx} = \frac{dz}{dx} \cdot \frac{dy}{dz}$

$$\Rightarrow \frac{dy}{dx} = \frac{a}{ax+b} \left(\frac{dy}{dz} \right) \quad [\because \text{from equation (3)}]$$

$$\Rightarrow (ax+b) \frac{dy}{dx} = a \frac{dy}{dz}$$

$$\Rightarrow (ax+b) \frac{dy}{dx} = a D'y \quad \text{--- (4)}$$

where $D' = \frac{d}{dz}$

$$\text{Similarly } (ax+b)^2 \frac{d^2 y}{dx^2} = a^2 D'(D'-1)y \quad \text{--- (5)}$$

$$\therefore (ax+b)^3 \frac{d^3 y}{dx^3} = a^3 D'(D'-1)(D'-2)y \quad \text{--- (6)}$$

Substituting eqn (4), (5) and (6) in eqn (1) to obtain a linear differential eqn with constant coefficient.

MISCELLANEOUS DIFFERENTIAL EQUATIONS

The method of Solving differential equations of the following forms.

1. $\frac{d^2y}{dx^2} = f(x)$ 2. $\frac{d^2y}{dx^2} = f(y)$

① equation of the form $\frac{d^2y}{dx^2} = f(x)$

Consider the differential equation of the form

$$\frac{d^2y}{dx^2} = f(x) \quad \text{--- (1)}$$

Integrating equation (1) with respect to 'x',

$$\frac{dy}{dx} = \int f(x) dx + C$$

$$\Rightarrow \frac{dy}{dx} = F(x) \quad \text{--- (2)}$$

Again integrating equation (2) with respect to 'x',

$$y = \int F(x) dx + C_1$$

which is the required solution.

Note: The solution of differential equation of the form $\frac{d^ny}{dx^n} = f(x)$ can be obtained by integrating it n times successively.

② equation of the form $\frac{d^2y}{dx^2} = f(y)$

Consider the differential equation of the form

$$\frac{d^2y}{dx^2} = f(y) \quad \text{--- (1)}$$

Multiplying equation (1) on both sides by $2 \left[\frac{dy}{dx} \right]$

$$2 \frac{dy}{dx} \cdot \frac{d^2y}{dx^2} = 2 \frac{dy}{dx} f(y) \quad \text{--- (2)}$$

Integrating equation (2) with respect to 'x',

$$\left(\frac{dy^2}{dx} \right) = 2 \int f(y) dy + C$$

$$\Rightarrow \left(\frac{dy}{dx} \right)^2 = F(y)$$

$$\Rightarrow \frac{dy}{dx} = \sqrt{F(y)}$$

Separating the variables,

$$\frac{dy}{\sqrt{F(y)}} = dx$$

Integrating on both sides

$$\int \frac{dy}{\sqrt{F(y)}} = \int dx$$

$$\Rightarrow \int \frac{dy}{\sqrt{F(y)}} = x + C$$

Which is the required solution.

PARTIAL DIFFERENTIAL EQUATIONS: FORMATION AND SOLUTION

The partial differential equation by eliminating the arbitrary constants a, b from $2z = (x+a)^{1/2} + (y+a)^{1/2}$
Given equation is

$$2z = (x+a)^{1/2} + (y+a)^{1/2} + b$$

$$\Rightarrow 2z = [\sqrt{x+a} + \sqrt{y+a}] + b \quad \text{--- (1)}$$

Partially differentiating equation (1) with respect to

$$2 \frac{\partial z}{\partial x} = \frac{1}{2\sqrt{x+a}} + 0$$

$$4 \frac{\partial z}{\partial x} = \frac{1}{\sqrt{x+a}}$$

$$\text{let, } \frac{\partial z}{\partial x} = p$$

$$4p = \frac{1}{\sqrt{x+a}}$$

$$\Rightarrow \sqrt{x+a} = \frac{1}{4p}$$

$$\Rightarrow x+a = \frac{1}{16p^2}$$

$$\Rightarrow a = \frac{1}{16p^2} - x \quad \text{--- (2)}$$

Partially differentiating equation (1) with respect to y

$$2 \frac{\partial z}{\partial y} = \frac{1}{2\sqrt{y+a}} + 0$$

$$\Rightarrow 4 \frac{\partial z}{\partial x} = \frac{1}{\sqrt{y-a}}$$

$$\text{let } \frac{\partial z}{\partial y} = q$$

$$4q = \frac{1}{\sqrt{y-a}}$$

$$\Rightarrow \sqrt{y-a} = \frac{1}{4q}$$

$$\Rightarrow y-a = \frac{1}{16q^2}$$

$$\Rightarrow y = \frac{1}{16q^2} + a \quad \text{--- (3)}$$

Substituting equation (2) in equation (3),

$$y = \frac{1}{16q^2} + \frac{1}{16p^2} - x$$

$$y+x = \frac{1}{16p^2} + \frac{1}{16q^2}$$

$\therefore 16(x+y) = \frac{1}{p^2} + \frac{1}{q^2}$ is the required partial differential equation.

EQUATION EASILY INTEGRABLE

$$\text{Solve } y \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial z}{\partial x} = 4xy$$

Given partial differential equation is

$$y \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial z}{\partial x} = 4xy$$

$$\Rightarrow y \frac{\partial}{\partial y} \left(\frac{\partial z}{\partial x} \right) + \frac{\partial z}{\partial x} = 4xy$$

$$\Rightarrow y \frac{\partial}{\partial y} p + p = 4xy \quad \left[\because p = \frac{\partial z}{\partial x} \right]$$

Keeping 'x' fixed and integrating above equation with respect to 'y',

$$\int y \frac{\partial p}{\partial y} dy + \int p dy = \int 4xy dy$$

$$\Rightarrow y \int \frac{\partial p}{\partial y} dy - \int \left[\int \frac{\partial p}{\partial y} dy \right] dy + py = \frac{4xy^2}{2} + u(x)$$

$$\Rightarrow yp - \int p dy + py = 2xy^2 + u(x)$$

$$\Rightarrow yp - py + py = 2xy^2 + u(x)$$

$$\Rightarrow py = 2xy^2 + u(x)$$

Keeping 'y' fixed and integrating above equation with respect to 'x',

$$\int py dx = \int 2xy^2 dx + \int u(x) dx$$

$$\Rightarrow \int y \frac{\partial z}{\partial x} dx = \int 2xy^2 dx + \int u(x) dx$$

$$\Rightarrow zy = \frac{2x^2}{2} y^2 + v(x) + w(y)$$

$$\Rightarrow z = x^2 y = \frac{v(x)}{y} + \frac{w(y)}{y}$$

where $v(x)$ and $w(y)$ are arbitrary functions

$\therefore z = x^2 y + \frac{v(x)}{y} + w(y)$ is the required solution

LINEAR EQUATION OF FIRST ORDER

The procedure of solving first order linear partial differential equations (Lagrange's equations).

The general form of Lagrange's linear equation is,

$$Pp + Qq = R \quad \text{--- (1)}$$

where P, Q, R are functions of x, y, z .

In order to solve equation (1) using method of grouping.

The steps to be followed are.

Step 1:

Rewrite the equation in standard form [if necessary]

$$Pp + Qq = R$$

Step 2:

form the subsidiary equations or auxiliary equations

$$\text{i.e., } \frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$$

Step 3:

Any two independent solution of the subsidiary equations are to be determined. let the two solutions be $u = a$ and $v = b$ (a and b are constants)

Step 4:

Write the complete solution as $\phi(u, v) = 0$ or $u = f(v)$

Step 5:

Case (i) Any two equations form, $\frac{dx}{P} = \frac{dy}{Q}$ or $\frac{dy}{Q} = \frac{dz}{R}$

or $\frac{dx}{P} = \frac{dz}{R}$ can be directly solved and the solution of such equations are $u(x, y) = \text{constant}$ or $v(y, z) = \text{constant}$ or $w(z, x) = \text{constant}$. Therefore, a complete solution (2) is obtained.

Case(ii):

If only one equation is considered i.e. $\frac{dx}{P} = \frac{dy}{Q}$, then its solution obtained is $u(x, y) = C_1$, here 'y' can be expressed in terms of x. Then substituting 'y' in equation $\frac{dy}{Q} = \frac{dz}{R}$. The resultant equation obtained is integrated whose solution is $v(y, z) = C_2$.

Therefore the two solution i.e. $u = C_1$ and $v = C_2$ yield the complete solution.

⇒ DIFFERENTIAL EQUATIONS OF FIRST ORDER BUT NOT OF FIRST DEGREE

A differential equation of first order but not of the first degree (say n^{th} degree) can be written in the form,

$$(P - f_1(x, y)) (P - f_2(x, y)) \dots (P - f_n(x, y)) = 0$$

Where,

$$P = \frac{dy}{dx}$$

The above equation is solvable for P , if the equations of first order and first degree are obtained by equating each factor to zero.

$$\text{i.e., } (P - f_1(x, y)) = 0, (P - f_2(x, y)) = 0 \dots (P - f_n(x, y)) = 0$$

Let,

the solutions of above factors be,

$$\phi_1(x, y, c_1) = 0, \phi_2(x, y, c_2) = 0 \dots \phi_n(x, y, c_n) = 0$$

Where,

$$c_1 = c_2 = c_3 = \dots c_n = c \text{ (arbitrary constant)}$$

Hence the solution is given as,

$$\phi_1(x, y, c) \phi_2(x, y, c) \dots \phi_n(x, y, c) = 0$$

⇒ EQUATIONS SOLVABLE FOR y .

A differential equation of first order but not of the first degree is expressed as,

$$F(x, y, p) = 0 \quad \text{--- (1)}$$

Where,

$$p = \frac{dy}{dx}$$

If the equation (1) is solvable for ' y ', then

$$y = f(x, p) \quad \text{--- (2)}$$

Differentiating equation (2) with respect to ' x '

$$p = \frac{dy}{dx} = \phi \left[x, p, \frac{dp}{dx} \right] \quad \text{--- (3)}$$

Equation (3) is reduced to two variables x and p . The solution will be in the form of

$$F(x, p, c) = 0 \quad \text{--- (4)}$$

The elimination of p between equations (2) and (4) gives the relation between x, y and c , which is the required solution.

⇒ EQUATIONS SOLVABLE FOR X.

A differential equation of first order but not of the first degree is expressed as

$$F(x, y, p) = 0 \quad \text{--- (1)}$$

Where,

$$p = \frac{dy}{dx}$$

If the equation (1) is solvable for 'x' then

$$x = f(y, p) \quad \text{--- (2)}$$

Differentiating equation (2) with respect to 'y',

$$\frac{dx}{dy} = \phi(y, p, \frac{dp}{dy})$$

$$\Rightarrow \frac{1}{p} = \phi(y, p, \frac{dp}{dy}) \quad [\because p = \frac{dy}{dx}] \quad \text{--- (3)}$$

By integrating equation (3) a relation between p and y is obtained as

$$F(y, p, c) = 0 \quad \text{--- (4)}$$

By eliminating p from equations (2) and (4), the relation between x, y and c is obtained, which is the desired solution.

⇒ EQUATIONS HOMOGENEOUS in x AND y

Equations that do not contain x .

The differential equation of the form

$$F(x, y, p) = 0 \quad \text{--- (1)}$$

i.e. 'x' term is not present

If the equation (1) is solvable for 'y'

Then

$$\frac{dy}{dx} = \phi(p) \quad \text{--- (2)}$$

Integrating equation (2)

$$y = F(p)$$

For

Equation that do not contain 'y'

The differential equation of the form

$$F(x, p) = 0 \quad \text{--- (1)}$$

i.e., 'y' term is not present

If the equation (1) is solvable for x ,

$$\frac{dx}{dy} = \phi(p) \quad \text{--- (2)}$$

Integrating equation (2),

$$x = F(p)$$

⇒ EQUATIONS OF THE FIRST DEGREE IN
X AND Y.

$F(x, y, p) = 0$ is of the form of first
degree in x and y , then

$$y = xf_1(p) + f_2(p) \quad \text{--- (1)}$$

Equation (1) is called as Lagrange's equation.
Differentiating equation (1) with respect to ' x ;

$$\frac{dy}{dx} = xf_1(p) \frac{dp}{dx} + f_1(p) + f_2(p) \frac{dp}{dx}$$

$$\Rightarrow p = f_1(p) + [xf_1'(p) + f_2'(p)] \frac{dp}{dx} \quad \left[\because p = \frac{dy}{dx} \right]$$

$$\Rightarrow p - f_1(p) = [xf_1'(p) + f_2'(p)] \frac{dp}{dx}$$

$$\Rightarrow [p - f_1(p)] \frac{dx}{dp} = xf_1'(p) + f_2'(p)$$

$$\Rightarrow \frac{dx}{dp} = \frac{xf_1'(p)}{p - f_1(p)} + \frac{f_2'(p)}{p - f_1(p)}$$

$$\Rightarrow \frac{dx}{dp} + \frac{xf_1'(p)}{f_1(p) - p} = \frac{f_2'(p)}{p - f_1(p)}$$

Equation (2) is a linear differential equation
in x and p .

Therefore, the solution of equation (2) is
of the form,

$$x = \phi(p, c) \quad \text{--- (3)}$$

The solution can be obtained by eliminating p from equations (1) and (3)

If the elimination of p is not possible, then the value of x and y are found in terms of p from equations (1) and (3), generate the desired solution.

The Clairaut's equation .

$$y = px + f(p) \quad \text{--- (1)}$$

Differentiating equation (1) with respect to ' x ',

$$\frac{dy}{dx} = p + x \frac{dp}{dx} + f'(p) \frac{dp}{dx}$$

$$\Rightarrow p = p + [x + f'(p)] \frac{dp}{dx}$$

$$\Rightarrow \frac{dp}{dx} [x + f'(p)] = p - p$$

$$\Rightarrow [x + f'(p)] \frac{dp}{dx} = 0$$

$$\Rightarrow \frac{dp}{dx} = 0 \quad \text{and} \quad \text{--- (2)}$$

$$x + f'(p) = 0 \quad \text{--- (3)}$$

The singular solution is obtained by eliminating 'p' from equation (1) and (3)

From equation (2),

$$p = c \quad \text{--- (4)}$$

substituting equation (4) in equation (1),

$$y = cx + f(c) \quad \text{--- (5)}$$

\therefore The general solution for

$$y = px + f(p) \text{ is } y = cx + f(c)$$

Radioactivity and carbon dating

Half life :-

Half life is defined as the time taken by the radio active substance to disintegrate by half of its initial amount. It is used to measure the stability of radioactive materials.

Examples :-

- i) Half life of radium (Ra-226) ≈ 1700 years
(disintegrated to Radon (Rn-222))
- ii) Half life of iodine -131 ≈ 8.1 days
- iii) Half life of carbon-14 ≈ 5568 years.

Conclusion:-

- 1) This project gives the knowledge of how to solve the differential equations by using different methods
- 2) within short time student can revision all the methods to solve differential equations
- 3) From this project students can be benefited for competitive exam.

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DEPARTMENT OF POLITICAL SCIENCE
STUDENT STUDY PROJECT

2020-21

TITLE : STATE GOVERNOR

Certified that this is a bonafide work done by the following B.A 1st year students of this college in the subject of Political Science.

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INTRODUCTION : Most of the provision in the Constitution of India is derived from the Government of India Act 1935. Accordingly, under this Act, the Governors were “by the Raj, of the Raj and for the Raj”. The members of the Constituent Assembly were proposed by the members of the sub-committee consisting of B.G. Kher, K.N. Katju and P. Subbarayan. Since then arose a clash between the powers of the Governor and the Chief Minister, the system of appointed Governor of the state came into existence. The Constitution of India provides for the position of a Governor in every State. Article 153 lays out that there shall be a Governor for each state and in some cases, the same person can be appointed as Governor of two or more states as facilitated by the 7th Constitutional Amendment Act of 1956. The Governor is the chief executive head of the State but he enjoys only nominal or titular power like the President of India. The Governor, on the other hand also acts as the agent of Central Government which means that his office has a dual role.

Appointment, Tenure, and Qualifications :

Article 155 lays out that the Governor shall be appointed by the President by warrant under his seal. It means that he is neither directly elected by the people nor indirectly by the electoral college as in the case of the President. The term of the office of the Governor is usually for 5 years but Article 156 lays out that the Governor shall hold office only during the pleasure of the President and resignation by the governor. The constitution of India provides for only 2 qualifications for a person to be appointed as a Governor. Article 157 highlighted that no person shall be eligible for appointment as Governor unless he is a citizen of India and has completed the age of 35 years. According to article 158, there are certain conditions for a person to hold the office of the Governor. They are a) He shall not be a member of either Houses of the Parliament or Legislature; b) He shall not hold any office of profit; c) He shall be entitled to use free official resident and other allowance, emoluments and privileges; d) if he is appointed as a Governor of 2 or more states, he will be entitled to emoluments and allowances according to funds allocated among the States proportionately as determined by the President; e) during his term of office, the emoluments and allowances shall not be diminished.

Powers and Functions:

The Governor of State possesses executive, legislative, financial and judicial powers which are briefed as under.

Executive functions:

All the executive actions of the state government are taken in his name formally (Art 166).

He is responsible for appointing the Chief Ministers and other Ministers.

He has the power to appoint Tribal Welfare Minister in the states of Chattisgarh, Jharkhand, Madhya Pradesh and Odisha (Bihar was excluded by 94th Amendment Act, 2006)

He appoints the State Election Commissioner and Advocate General.

He also appoints the Chairman and members of the State Public Service Commission but they can be removed only by the President and not the Governor.

He cannot delay an emergency in the State but can recommend the imposition of a constitutional emergency to the President.

He acts as the Chancellor of the State Universities and also appoints Vice-Chancellors of universities in the state.

Legislative functions:

He can summon or prorogue the State Legislature as well as can dissolve the State Legislative assembly.

He addresses the State Legislature at the commencement of each session and also the first session ever year.

In case the office of the speaker or the deputy speaker fall vacant, he can appoint any member of the State Legislative assembly to preside over its proceedings.

He nominates 1/6th of the members of the Legislative council from people with special knowledge.

In consultation with the Election Commission, he can decide on disqualifying a member of the State Legislature.

After the bill has been passed in the Legislature, he can give his assent to the bill, withhold it or return the bill for reconsideration. If the bill is again passed in the Legislature, with or without the amendment, he has to give assent to the bill. He can also reserve the bill for consideration of the President.

The most important Legislative function is that he can make ordinances when the state legislature is not in session and it must be approved by the state legislature within 6 weeks from its reassembly.

Financial Powers:

He ensures that the Annual State Budget (Annual Financial Statement) is laid before the State Legislature.

Only with his prior recommendation can a money bill be introduced in the State Legislature.

If there are any unforeseen circumstances, he can make use of the Contingency Fund of the state to meet expenditure.

He also constitutes a Finance Commission after every 5 years to review the financial position of the Panchayats and the Municipalities.

Judicial Powers:

He has the power to grant pardons, respites, suspension of punishments, the remit of commute any person convicted of any offence against any law (Article 161).

While appointing Judges of any State High Court, he is consulted by the President.

Governor, in consultation with the State High Court, makes appointment, posting and promotion of District Judges.

The constitutional position of Governor:

As the Governor is the nominal head of the state, he is not empowered to exercise real power. Real power is vested on the Chief Minister and Council of Ministers. Specific reference has to be made while analysing his constitutional position which is laid out in Articles 154, 163 (discretionary power) and 164.

Article 256 states that every state should utilise its executive powers in line with the laws made by the Parliament and further mentioned that the Union may exercise its executive power to direct the State when the Government deems fit for a certain purpose.

Article 257 (1 and 2) makes it clear that the executive power of States should exercise without hindering the exercise of the executive power of the Union. It also extends to give directions to a State for the construction and maintenance of means of communication declared in the direction to be of national or military importance.

Article 355 "entrust the duty upon the Union government to protect the States against external aggression and internal disturbance and to ensure that the Government of every State is carried on as per the provisions of the Constitution.

Article 356 maintains that if the State Government is unable to function according to the provisions laid out in the Constitution, the Union Government can take direct control of the State Machinery. The Governor of the state can proclaim after he has obtained the consent of the President of India.

Article 357 focuses on the exercise of legislative powers under the Proclamation issued under Article 356 by the Central Government.

The constitution highlights the possibility of the Governor acting at his discretion, such a possibility has not been made for the President. Also, the ministerial advice has been made binding on the President by the 42nd Constitutional Amendment Act 1976, it is not the same for the Governor. The decision of the Governor is final if any question arises then the matter falls within the discretion of the Governor or not. Hence, it can be said that he enjoys Constitutional discretion but his action has to be in line with the direction of the Union government.

Special Powers and Responsibilities of the Governor:

Governor is vested with certain special responsibilities on President's Discretion. Though he has to consult the Chief Minister and the Council of Ministers, the final action lies at his discretion. Some of which are as follows:

Establishment of Separate development boards for Vidarbha and Marathwada in Maharashtra; for Saurashtra and Kutch in Gujarat; Hyderabad-Karnataka in Karnataka.

With respect to law and order in Nagaland as long as internal disturbance persists in the Naga Hills- the Tuensang region continues.

With respect to the administration of tribal areas in Assam.

Regarding the administration of hill areas in Manipur.

For ensuring socio-economic advancement of the different sections of the population in Sikkim

Concerning law and order in Arunachal Pradesh.

Conclusion:

In the past few years, there has been a lot of debate regarding the powers and functions of the governor. Few example can be taken like Goa (2017), Meghalaya (2018), Manipur (2017) and Karnataka (2018). Karnataka has been in the headlines recently (2021) regarding a similar issue when the Union government instructed the Governor of Karnataka, Vajubhai Vala to chair an all-party virtual meeting. Constitutionally, he has to refrain from entertaining any party-related activities and the decision to call a meeting is entirely under the Chief Minister. For the office of Governors to function effectively and to maintain institutional credibility, the appointment process of the Governors requires revision which should also involve State Governments. A Constitutional Amendment is needed that includes political as well as a legal consensus for the appointment, powers and functioning of the Governors who can act as the custodian of the constitutional governance. He/she should not be polarised to any one party or ideology and should not act at the behest of the Union Government alone. In performing his duty as a Governor, he should be impartial and act according to his discretion. The role of a Governor is very significant in the proper functioning of Constitutional Democracy. Hence, a well-knitted procedure of appointment, his powers and functions should be laid down and he should be entitled to act independently rather than being instructed by the Central Government.