SANT GADGE BABA AMRAVATI UNIVERSITY
YVASHAKTI ARTS & SCIENCE COLLEGE
EDUCATIONAL FIELD VISIT
REPORTDEPARMENT OF MICROBIOLOGY

Educational visit has its own importance in career of student by providing an excellent opportunity for interaction with laboratory industries. Exposure to laboratory industrial environment will benefit students by exhibiting the potential and functional opportunity of various different sectors of this field.

On "4 October 2021", near by 19 students with 4 lecturer went for one day laboratory visit to The skill Tree Consulting Pvt. Ltd training institute with an aim to learn more about phlebotomy, lab setup and instrumentation. The institute provide training for job and entrepreneurship opportunities for unemployed youth through training in health care sector .The institute is currently housed in a recently constructed building with two spacious classrooms . The department has equipment's which are required for phlebotomy practical and experimentation.

All students get information and live demo about howto collect blood samples for testing ,donations and transfusion and also how to deal with patients or maintaining laboratory equipment and transporting specimens.

Our students ask some questions related to pricking and handling of syringes. The institutional visit was

successful and we believed that our objectives was achieved. We learn something new and beneficial forus.

Time	Venue and activity
11.15 AM	The skill tree consulting Pvt .LtdTraining Institute Presentation Content - Demonstration Of Phlebotomy - Good laboratory practices
11.45 AM	Lab Visit 1)Demonstration lab 2) Sample preservation room
12.45 AM	Light refreshment Group photo session
1.10 PM	Activity Ended

Yuvashakti Arts & Science College Amravati

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Amravati

SANT GADGE BABA AMRAVATI UNIVERSITY

Yuvashakti Arts & Science College Amravati.

ATTENDENCE SHEET

Class: B. Sc. II Sem. IV Sub: Microbiology/BTC Date:

Topic: _____

Sr.No.	Name of Student	Signature
1)	Kiran Anilrao Nitnawarse	Kiran
2)	Simran Amol Khadse	Skhadse.
3)	Rohini prakash Raut	Raut
4)	Rahul Sanjay Gadekar	Rgadekar
5)	Puja Anilrao chinche	Pchinche
6)	Kawsar Hindrakshak Balasaheb	Hkawsare
7)	Srushti T. Waghmare	Srushti
8)	Lokesh B. Mawaskar	LokeshBM.
9)	Ruchita Ishwardas khadse	Rukhadse
10)	Manji D. Shende	M.D Shende
11)	Naveen Premdas Telgote	NPtelgote
12)	Dinesh R. Bethekar	Dbethekar
13)	Gaurav P. kukade	Gaurav kukade
14)	Sanket M kathane	Skathane
15)	Dipak D. chauhan	Dchauhan
16)	Dhiraj R khandekar	Dkhandekar
17)	Rushikesh R Thakur	Rthakur
18)	Nikhil K. Rathod	Nrathod
19)	Yash M. Thakare	Ythakare

Asst. Professor
Yuvashakti Art's and Science College
Amravati

Yuvashakti Art's & Science College * Amravati *

Principal
Yuvashakti Arts & Science College
Amravati

SANT GADGE BABA AMRAVATI UNIVERSITY

Yuvashakti Arts & Science college Amravati.

Dapartment of Zoology

Field Visit Report

As mention in the syllabus of SGBA University Zoology department arranged a educational field visit on 11 October 2021, more than 22 students with four lectures went for one day filed visit to the Chhatri Talao Garden Amravati with an aim to learn more about birds and reptiles it's importance in all possible fields.

In Chhatri talao garden Many butterfly available in different colors and many attractive places one lake present in a Chhatri Talao which is the very attractive and in that lake many fishes small zoo plankton and some species of reptiles also seen.

Chhatri talao garden is a attractive Place for many birds seen in that area.

There are two properties of chhatri talao garden that's attracts birds

1.shoot and leaves particles are good nesting material for birds.

2. Plant is excellent source of cover for birds which protecting the birds from predator and other things.

Chhatri talao attracts many birds because birds get abundant food and also best protection cover. Chhatri talao is a unique types garden in many tall tree are present which is best for nesting of birds.

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Amravati

Chhatri talao located near vinayak vidhya mandir college dastur nagar square, Amravati. These garden is open from 10am to 5 pm for people and most significance is no fee for entry in garden.

Main attraction of our field visit is small fishes which is present in large quantity at shore of lake. Students gets excited to see them and learn lot about structure of fish, there pattern of movement and about there food habit.

Another attraction of our field visit is flock of crow at the top of tree. These crow is producing sound and fly from one plant to another plant. water is supply from chhatri talao to some part of Amravati. In early time chhatri talao is main source of water for Amravati

Our field visit started with curiosity, question about birds , insects and aquatic organism like fishes. Is all fishes is herbivores or not. This study tour is ended with lots of fun and knowledge. The field visit was successful and we achieved the objectives. We learn something new and beneficial for us.

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Yavashakti Arts & Science Colleg
Amravati

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Yuvashakti Arts & Science College Amravati.

ATTENDENCE SHEET

Class : Sub: Zoology Date :

Topic : Field visit (2021-22)

Sr.No.	Name of Student	Signature
1)	Simran Amol Khadse	Khadse
2)	Rohini prakash Rewle	Rewle
3)	Komal vilas Ichedge	
4)	priyanka D. Lahule	
5)	Anusha .M. Thakare.	Mthakare
6)	Shivani .S. Mohune	
7)	Rachana D. Moinkhede	Rachana
8)	Sahil D. Khairbodkar	
9)	Pawan .G. Upadhye	Upadhye
10)	Rushikesh R. Thakur	Rthakur
11)	Dhiraj Raju Khandekar	Khandekar
12)	Prati'K A. Bande.	PABande
13)	Aarti shivaji Shelke	
14)	Mayuri Kailas Bharsakale	Bhasakale
15)	Rushali ~~Sat~~ Sureshrao Lahibaje	Rushali
16)	Pragati G. Wakode	Gwakode
17)	Shaikh Mohd Shaikh Sabir	Mais
18)	Ahzaz Yunus Kaiser	
19)	Manisha Arun Ghatte	
20)	Poonam Tarab Surathe	
21)	Ruddi Ganesh Bharsakale	Bansakale
22)	Ritesh Dayaram Akhande	
23)	Rohit Gopalrao Khatale	
24)	Rahul Vilas Uke	

युवाशक्ती कला व विज्ञान महाविद्यालय

Field Visit

Sant Gadge Baba Amravati University, Amravati

Yuvashakti Arts and Science College, Amravati

Department of Chemistry

Project Title : Fluorescence Microscopy

Submitted by: AMOL SUKHADAN

KU.CHINCHE PUJA ANILRAO

KU.JOGI AACHAL DHANARAJ

KU.BETHEKAR KALPANA CHANDAN

DHANDE TEJAS SURESHRAO

B.Sc III Year Sem: 5th

Guided by : Prof. V.R. Bondre

Certificate

This is to certify that the project is titled Fluorescence Microscopy. This project is submitted by Mr. Amol Sukhdan . He had successfully completed his chemistry project. Under the Guidance of Miss. V.R. Bondre

Miss. V.R. Bondre

What is a Fluorescence Microscope?

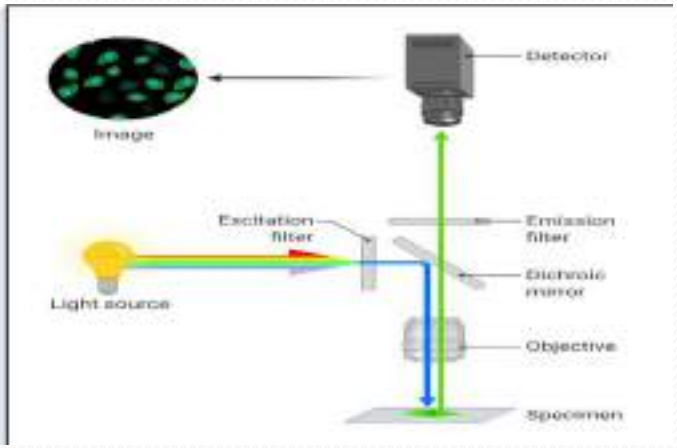
A **fluorescence microscope** is an optical microscope that uses fluorescence and phosphorescence instead of, or in addition to, reflection and absorption to study the properties of organic or inorganic substances. Fluorescence is the emission of light by a substance that has absorbed light or other electromagnetic radiation while phosphorescence is a specific type of photoluminescence related to fluorescence. Unlike fluorescence, a phosphorescent material does not immediately re-emit the radiation it absorbs. The fluorescence microscope was devised in the early part of the twentieth century by August Köhler, Carl Reichert, and Heinrich Lehmann, among others.

Principle of Fluorescence Microscope

Most cellular components are colorless and cannot be clearly distinguished under a microscope. The basic premise of fluorescence microscopy is to stain the components with dyes. Fluorescent dyes, also known as fluorophores or fluorochromes, are molecules that absorb excitation light at a given wavelength (generally UV), and after a short delay emit light at a longer wavelength. The delay between absorption and emission is negligible, generally on the order of nanoseconds.

The emission light can then be filtered from the excitation light to reveal the location of the fluorophores.

Fluorescence Microscopy



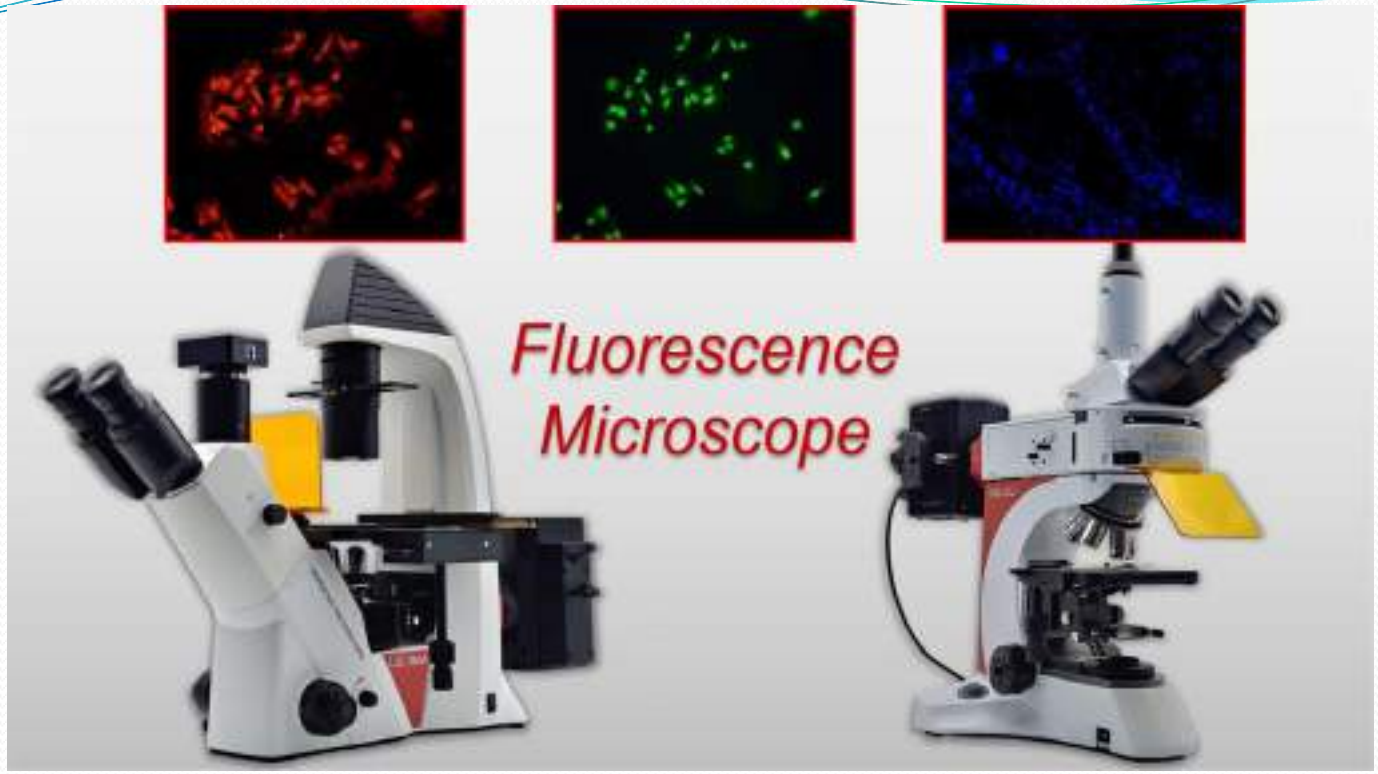
- Fluorescence microscopy uses a much higher intensity light to illuminate the sample. This light excites fluorescence species in the sample, which then emits light of a longer wavelength.
- The image produced is based on the second light source or the emission wavelength of the fluorescent species rather than from the light originally used to illuminate, and excite, the sample.

Working

Light of the excitation wavelength is focused on the specimen through the objective lens. The fluorescence emitted by the specimen is focused on the detector by the objective. Since most of the excitation light is transmitted through the specimen, only reflected excitatory light reaches the objective together with the emitted light.

Forms

The “fluorescence microscope” refers to any microscope that uses fluorescence to generate an image, whether it is a more simple set up like an epifluorescence microscope, or a more complicated design such as a confocal microscope, which uses optical sectioning to get better resolution of the fluorescent image. Most fluorescence microscopes in use are epifluorescence microscopes, where excitation of the fluorophore and detection of the fluorescence are done through the same light path (i.e. through the objective).


Fluorescence
Microscope

Fluorescent dyes (Fluorophore)

A fluorophore is a fluorescent chemical compound that can re-emit light upon light excitation.

Fluorophores typically contain several combined aromatic groups, or plane or cyclic molecules with several π bonds.

Many fluorescent stains have been designed for a range of biological molecules.

Some of these are small molecules that are intrinsically fluorescent and bind a biological molecule of interest. Major examples of these are nucleic acid stains like DAPI and Hoechst, phalloidin which is used to stain actin fibers in mammalian cells.

Applications of Fluorescence Microscope

To identify structures in fixed and live biological samples. Fluorescence microscopy is a common tool for today's life science research because it allows the use of multicolor staining, labeling of structures within cells, and the measurement of the physiological state of a cell.

Thank You!

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

Yuvashakti Arts and Science College, Amravati

Department of Chemistry

Project Title : Chemical Pesticides and Human Health: The Urgent Need for a New Concept in Agriculture

Submitted by:

KU.SAHARE VAISHNAVI VIJAYRAO

CHAVHAN SHUBHAM

KU.KHADSE AACHAL RAMESHRRAO

KU.CHAVHAN PRIYANKA MADHUKAR

KU.UKEY CHANCHAL PANJABRAO

B.Sc III Year Sem: 5th

Guided by : Prof. V.R. Bondre

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Introduction

Pesticides are substances or mixtures of substances that are mainly used in agriculture or in public health protection programs in order to protect plants from pests, weeds or diseases, and humans from vector-borne diseases, such as malaria, dengue fever, and schistosomiasis. Insecticides, fungicides, herbicides, rodenticides, and plant growth regulators are typical examples . These products are also used for other purposes, such as the improvement and maintenance of non-agricultural areas like public urban green areas and sport fields . Furthermore, there are other less known applications of these chemical substances, such as in pet shampoos , building materials, and boat bottoms in order to eliminate or prevent the presence of unwanted species .

Residues of pesticides can be found in a great variety of everyday foods and beverages, including for instance cooked meals, water, wine, fruit juices, refreshments, and animal feeds . Furthermore, it should be noted that washing and peeling cannot completely remove the residues . In the majority of cases, the concentrations do not exceed the legislatively determined safe levels. However, these “safe limits” may underestimate the real health risk as in the case of simultaneous exposure to two or more chemical substances, which occurs in real-life conditions and may have synergistic effects. Pesticides residues have also been detected in human breast milk samples, and there are concerns about prenatal exposure and health effects in children.

Organochlorine Pesticides

The most widely known organochlorine pesticide is dichlorodiphenyltrichloroethane, i.e., the insecticide DDT, the uncontrolled use of which raised many environmental and human health issues. Dieldrin, endosulfan, heptachlor, dicofol, and methoxychlor are some other organochlorines used as pesticides.

There are a few countries that still use DDT or plan to reintroduce it for public health purposes Furthermore, DDT is also used as a solution in certain solvents It is a ubiquitous chemical substance, and it is believed that every living organism on Earth has a DDT body burden, mainly stored in the fat. There is also evidence that DDT and its metabolite p,p-dichlorodiphenyldichloroethylene (DDE) may have endocrine-disrupting potential and carcinogenic action . *In utero* exposure to both DDT and DDE has been associated with neurodevelopmental effects in children . Moreover, a recent study related DDE to hepatic lipid dysfunction in rats .

Organophosphorus Pesticides

Organophosphates, which were promoted as a more ecological alternative to organochlorines , include a great variety of pesticides, the most common of which is glyphosate. This class also includes other known pesticides, such as malathion, parathion, and dimethoate; some are known for their endocrine-disrupting potential . This class of pesticides has been associated with effects on the function of cholinesterase enzymes , decrease in insulin secretion, disruption of normal cellular metabolism of proteins, carbohydrates and fats , and also with genotoxic effects and effects on mitochondrial function, causing cellular oxidative stress and problems to the nervous and endocrine systems .

Population-based studies have revealed possible relations between the exposure to organophosphorus pesticides and serious health effects including cardiovascular diseases , negative effects on the male reproductive system and on the nervous system, dementia , and also a possible increased risk for non-Hodgkin’s lymphoma . Furthermore, prenatal exposure to organophosphates has been correlated with decreased gestational duration and neurological problems occurring in children .

Other Classes of Chemical Pesticides

Triazines, such as atrazine, simazine, and ametryn, are another class of chemical pesticides that have been related to endocrine-disrupting effects and reproductive toxicity Moreover, it was found that there is a possible statistical relationship between triazine herbicides and breast cancer incidence Atrazine is the most known of the triazines, and it is a very widely used herbicide that has been associated with oxidative stress cytotoxicity and dopaminergic effects Furthermore, the exposure of experimental animals to atrazine has been associated with reproductive toxicity and delays in sexual maturation.

Urgent Need toward Cleaner and Safer Agricultural Practices

Current agricultural practices include the wide production and extensive use of chemicals known for their ability to cause negative health effects in humans and wildlife and to degrade the natural environment. Therefore, an urgent strategic approach is needed for a reduction in the use of agrochemicals and for the implementation of sustainable practices. Furthermore, current agriculture has to implement environmentally friendlier practices that pose fewer public health risks. Reforming agricultural practices aligned to fulfill these criteria is a step toward the sustainability of the agricultural sector in contrast to precision agriculture


CAUTION
PESTICIDE APPLICATION
KEEP
OFF

Thank You !

Permission Letter

To,
Principal,
Yuvashakti Arts and Science College,
Amravati.

Subject : About field visit.....

Respected Sir/Madam,

We organized educational visit for student, to create interest and awareness about subject. We organized field visit at Sanskrutik Bhawan Amt. Please give us permission for field visit.

Principal
Yuvashakti Arts & Science College
Amravati

Yuvashakti Arts & Science College Amravati

Principal
Yuvashakti Arts & Science College
Amravati

Filld Visit (2021-22)

युवाशक्ती कला व विज्ञान महाविद्यालयाच्या गृह अर्थशास्त्र विभागा अंतर्गत दिनांक 21.3.22 ला श्री संत ज्ञानेश्वर सांस्कृतिक भवन येथे स्वामिनी ग्रुपच्या वतीने आयोजित उद्योजकता प्रदर्शनीला भेट देण्यात आली

मुलींना स्वयंरोजगाराभिमुख करणे आणि उद्योजकतेला प्रोत्साहन देणे या उद्देशाने सदरची भेट आयोजित केली गेली

गृह अर्थशास्त्राच्या सिल्याबस नुसार अन्नसंरक्षणाअंतर्गत विविध प्रकारचे जाम जेली सरबते लोणचे पापड कुरवइया इत्यादी अनेक पदार्थांचे स्टॉल लावलेले होते तसेच विविध प्रकारच्या भरतकामाचे नमुने असलेले साइया आणि ड्रेस याशिवाय उत्कृष्ट रंगसंगती साधलेले पोस्टर आणि विविध प्रकारच्या बॅग पर्स किट या प्रदर्शनामध्ये होते या सर्व विविध गोष्टी पाहून मुलींच्या उद्योजकतेच्या संकल्पना अधिक स्पष्ट झाल्या

Principal
Yuvashakti Arts & Science College
Amravati

Principal
Yuvashakti Arts & Science College
Amravati

Yuvashakti Arts & Science college, Amt.

College Code No.174

Session : 2021-22

Program's Name : Field Visit at Sanskritik Bhuvan.

Sr.No.	Name of the student	Class
1	Pragati Wakode	P.Wakode
2	Rashmi Pahulkar	R.pahulkar
3	Aarti Wankhede	A.Wankhede
4	Chitra waduekar	Chitra Wadurkar
5	Ashwini Gurubhele	A.Gurubhele
6	Jayashri Jambhekar	Bhakar
7	Rushali Lahabar	R.Lahabar
8	Vaesha Bankar	V. Bankar
9	Ankita Dike	Dike
10	Laxmi Tipare	Laxmi Tipare
11	Soloni Nandagawali	Sonarnagawali
12	Sapna Kothule	S. Kothule
13	Tejaswini Sahare	Sahare
14	Usha Kale	Usha. Kale
15	Radha Pawar	R.pawar
16	RUSHALI LAHABAR	R. LAHABAR
17	Vaesha BANKAR	V. Bankar
18	Rashmi Pihulkar	R. Pihulkar
19	Pooja Saudagar	P. Saudagar
20	Namrata Khesde	N. Khesde
21	Sharda Ghogare	S. Ghogre
22	komal Jambhe	Komal Jambhe

Yuvashakti Arts & Science College Amravati

Principal
Yuvashakti Arts & Science College
Amravati

Permission Letter

To,
Principal,
Yuvashakti Arts and Science College,
Amravati.

Subject : About field visit.....

Respected Sir/Madam,

We organized educational visit for student, to create interest and awareness about subject. We organized field visit at Ajay Udhyog (Shamkule Nagar). Please give us permission for field visit.

Yuvashakti Arts & Science College Amravati

Principal
Yuvashakti Arts & Science College
Amravati

FIELD VISIT (2021-22)

युवाशक्ती कला व विज्ञान महाविद्यालयात मार्फत व गृहअर्थशास्त्र विभागाअंतर्गत संगीता खडसे यांच्या गृह उद्योगाला दिनांक. 15/02/2022 रोजी भेट देण्यात आली

सौ संगीता खडसे यांच्या गृह उद्योगांमध्ये विविध प्रकारची पापड तयार करण्यात येतात. उदाहरणार्थ साबुदाणा पापड, बटाटा पापड , नागली पापड, तांदूळ पापड इत्यादी.

हे सर्व पापड तयार करण्यासाठी त्यांच्याजवळ आटा भिजवण्यापासून ते पापड लाटून त्याचे कटिंग तयार होण्यापर्यंतच्या सर्व मशीन उपलब्ध आहे. त्याचप्रमाणे दहा ते बारा स्त्रिया कामगार तेथे काम करतात त्यामुळे त्यांनाही रोजगार मिळतो आणि सौ.खडसे यांचे देखील घर याच गृह उद्योगावर उत्तम प्रकारे चालते

नोकरी केल्यास एकच व्यक्ती कमावू शकते मात्र स्वयंरोजगार सुरू केल्यास एका सोबतच अनेक हातांना रोजगार संधी उपलब्ध होते

याच दृष्टिकोनातून विद्यार्थिनींनी प्रेरणा घेऊन स्वयंरोजगाराकडे प्रवृत्त व्हावे हा या भेटी मागचा उद्देश आहे

विद्यार्थिनींनी सौ संगीता खडसे यांच्याशी संवाद साधून आपल्या सगळ्या शंकांचे निरसन करून घेतले.

Yuvashekti Arts & Science College Amravati

Principal
Yuvashekti Arts & Science College
Amravati

Yuvashakti Samajik and Shaikshanik Sanstha, Amravati's

Yuvashakti Arts and Science College, Amravati (College Code- 174)

Affiliated to Sant Gadge Baba Amravati University, Amravati

Attendance Sheet

NAME OF THE PROGRAMME: Fild visit (Sai Gruh Udyog Shanker Nagar.

Date: 15/02/2022

Sr. No.	Name of Students	Class	Signature
1	Sapana Dashrath kothule	B.A.I	S. kothude
2	Usha S. Kale	B.A.I	Usha Kale
3	Sanjivani Patel	B.A.I	S. Pote
4	Rashmi Nagarmote	B.A.I	Ra. Nagarmote
5	Sangita S. Bethekar	B A I	Sangita Bethekar
6	Laxmi S Tipare	B.A.I	Laxmi Tipare
7	Tejaswini SAHARE	B.A I	Tsahare
8	Vaishali Kakad	B.A I	V Kakad
9	Sushama N. Halse	B.A.I	S. Halse
10	Sallond N. Nandagawli	B.A I	Snandagawli
11	Ankita K. Pulke	B.A.I	Apulke
12	Kalavati R. Sawalkar	B.A.I	K. Sawalkar
13	SWEHAL MANKAR	B.A.I	Bmanar
14	Samiksha Khadse	B.A.I	S. Khadse
15	Lata Dange	B.A.II	Lata Dange
16	Mamata S Mishra	B A I	Mamishra
17	JAYSHRI LONPANDE	B A I	J. Lonpande
18	Kajal Gade	B.A.I	Kajal Gade
19	Rosharani Bhethekar	B.A I	R. Bethekar
20	Kiran D. Munde	B.A.III	Kiran Munde
21	Kajal Dahane	B.A III	K. Dahane
22	Ganga T. Besen	B.A II	Gbesen

Principal
Yuvashakti Arts & Science College
Amravati

1.3.2

प्रती,
प्राचार्य,
युवाशक्ती कला व विज्ञान महाविद्यालय, अमरावती,

विषय:- शेक्षणिक वर्ष २०२१-२२ करिता भूगोल विभागाची शैक्षणिक सहलीला दि. १९/११/२०२१ रोजी चिखलदरा येथे नेण्याची संमती मिळण्याबाबत

माननीय महोदया,

भूगोल विषयात बि. ए. भाग ३ करिता अभ्यासक्रमात असलेल्या शैक्षणिक सहल अतर्गत आपल्या महाविद्यालयाची भूगोल विभागाची शेक्षणिक वर्ष २०२१-२२ करिता दि. १९/११/२०२१ रोजी चिखलदरा येथे नेत्याचे ठरवण्यात आले आहे. करीत श्रध्दा टूर कंपनीची बावीस आसनाची बस ठरवण्यात अली आहे. तसेच सहलीमध्ये सहभागी होणाऱ्या विद्यार्थ्यांचे पालकांचे संपतीपत्र घेण्यात आले आहे. करिता सदर सहलीला आपली संमती देण्यात यावी हि विनती.

Dr. Anand R. Dhote
Head of Deptt. Geography
Yuvashakti Arts & Science College
Amravati.

Yuvashakti Arts & Science College Amravati

प्राचार्य
युवाशक्ती कला व विज्ञान महाविद्यालय
अमरावती.

युवा शक्ती कला व विज्ञान महाविद्यालय

अमरावती

पर्यटन अहवाल

चिखलदरा

- मार्गदर्शक -

प्रा.डॉ. आनंद धोटे

भूगोल विभाग प्रमुख

संत गाडगेबाबा अमरावती विद्यापीठ, अमरावती

२०२१-२२

प्राचार्य
युवाशक्ती कला व विज्ञान महाविद्यालय
अमरावती

युवा शक्ती कला व विज्ञान महाविद्यालय अमरावती

DEPARTMENT OF GEOGRAPHY

CERTIFICATE

STUDY TOUR REPORT

This is Certify that,

Shri / Ku. _____ is a student of Geo. Dept of Yuva Shakti Art's And Commerce College, Chandur Bazar, has satisfactory carried out the Study Tour Report prescribed by University for the Under Graduate Degree course in Geography and the study Tour Report is submitted of Sant Gadge Baba University, Amravati, partial practical work of B.A. Part III for the academic year 2021-2022.

Teacher Incharge

Prof.Dr. Anand Dhote

Head of Department

Date : _____

अनुक्रमणिका

१. प्रस्तावना

गेल्या काही काळापासून पर्यटनाबाबत सामान्य लोकांची संकल्पना अत्यंत झपाट्याने बदलत आहे. निसर्गरम्य निसर्गाच्या सानिध्यात काही क्षण घालावयास तसेच आनंद लुटायला प्रत्येकाला आवडते. त्यामुळे अनेक पर्यटक, विविध स्थळांना भेटी देतात. त्यामुळे पर्यटकाला मिळणाऱ्या विविध सुविधांचा पर्यटन स्थळांना तसेच पर्यटनाचा मानसशास्त्राचा विचार करणे ही काळाची गरज आहे. कारण देशातील आणि परदेशातील अनेक पर्यटनस्थळी भेटी देण्याकरिता आल्यानंतर आवश्यक असणाऱ्या मुलभूत सोई उपलब्ध असेल तरच पर्यटकांची संख्या वाढेल व पर्यटन स्थळांचा विकासही गरजेचे आहे.

प्राचीन काळापासून प्रवास हा मानवी जीवनाचा एक अविभाज्य भाग बनलेला आहे. त्याकाळी ज्या विविध कारणांनी प्रवास केला जात असे त्यात अज्ञात प्रदेशाचा शोध घेणे, नवीन व चमत्कारिक स्थळांचा शोध घेणे, नविन पर्यावरणातील बदल अनुभवणे, धार्मिकदृष्ट्या पवित्र स्थळांना भेटी देणे इत्यादी गोष्टीचा प्रामुख्याने समावेश होता.

सध्या ज्या मानवी व्यवसायाला पर्यटन म्हणतात, त्याचे मुळ या प्राचीन प्रवासात आढळते. प्रवासाच्या तुलनेत पर्यटन ही संकल्पना आधुनिक व शास्त्रीय आहे. प्राचीन प्रवासाच्या तुलनेत पर्यटन ही संकल्पना आधुनिक पर्यटन व्यवसाय भिन्न आहे.

१.१ पर्यटनाचा उद्देश्य :

पृथ्वी वरील सर्व प्राण्यांमध्ये माणूस हा जिज्ञासू प्राणी आहे. म्हणूनच माणसाचे इतर सजीव सृष्टीच्या तुलनेने आपली स्थळाची वैशिष्टपूर्ण अशी वेगळी संस्कृती प्रस्थापित केली आहे. मानवाच्या जिज्ञासू वृत्तीतुनच नवनव्या ज्ञानविस्ताराच्या बाजु उजेडात आल्या मानसाची मानसिकता ही नाविण्य शोधण्याची असल्यामुळे विविध प्रकारचे भुखंडे शोधण्याचा तो प्रयत्न करित असतो.

भूगोल अभ्यासाला तौलणिक दृष्टीने अभ्यासण्यासाठी व त्या अभ्यासक्रमाचा अन्वयार्थ लावण्यासाठी सहलीच्या माध्यमातुन प्रत्यक्षरित्या मिळवलेल्या अनुभवाचा व ज्ञानाचा उपयोग होत असतो. पण तरीही वेगवेगळे भौगोलिक घटक, मानवी समाज व सांस्कृतीक घटक यांच्या प्रत्यक्ष परिणामातून शंका किंवा काही अनुत्तरीत प्रश्नांची समाधान शोधता येते. अशावेळी मानवी मनात निर्माण झालेल्या वेगवेगळ्या प्रश्नांची उत्तरे आपल्याला तर्कशास्त्ररित्या शोधायचे असतील तर प्रत्यक्ष अवलोकन करणे महत्त्वाचे ठरते.

उद्देश :

- ❖ भौगोलिक व सांस्कृतिक पर्यावरणातील घटनांचा प्रथम अनुभव करणे.
- ❖ आपल्या व्यक्तिमत्वाचा विकास करणे.
- ❖ अप्रत्यक्ष ज्ञानाची सत्यता पडताळून पाहणे.
- ❖ प्रत्यक्ष घटना स्थळांना भेट देवून अभ्यास करणे.
- ❖ नवीन शोधातूनच भौगोलिक अभ्यास समृद्ध करणे हे सर्वच घटक पर्यटनाशी निगडित असतात.

१.२ पर्यटनाचा अर्थ :

'पर्यटन' ही संज्ञा प्रवास या शब्दाशी संबंधीत आहे आणि प्रवास हा शब्द लॅटिन भाषेतील Tornos या शब्दापासून आलेला आहे. त्याचा अर्थ वर्तुळ असा आहे. याच शब्दापासून पुढे 'वर्तुळाकार प्रवास' किंवा 'पॅकेज टुर्स' हा शब्द रूढ झाला. इ.स. १६४३ मध्ये हा शब्द प्रथम वापरला गेला आणि त्याचा संदर्भ एका ठिकाणाहून दुसऱ्या ठिकाणी जाणे किंवा वर्तुळाकार प्रवास करणे वर्तुळाकार प्रवास करून निरनिराळी ठिकाणे पाहणे असा होतो.

१.३ पर्यटनाच्या व्याख्या :

१) हरमन श्युल्लर्ड या ऑस्ट्रेलियन अर्थतज्ञाच्या मते, "पर्यटन म्हणजे एक असा आर्थिक कार्यक्रम की, ज्यात लोकांचा प्रत्यक्ष देशांतर्गत किंवा परदेशी प्रवास, वास्तव्याचे ठिकाण एखादा देश, नगर किंवा प्रदेश या स्वरूपात असु शकते."

२) १९७६ मध्ये ब्रिटनमधील पर्यटन संस्थने पर्यटनाची व्याख्या करताना म्हटले आहे की, "पर्यटन म्हणजे लोकांनी त्यांच्या राहत्या स्थानापासुन काही अंतरा वरिल स्थानी अल्पकालीन केलेले स्थलांतर होय," हे स्थलांतर, संशोधन, व्यवसाय, मनोरंजन व ऐषआराम अशासाठी केलेले असते.

१.४ पर्यटनाचे महत्त्व :

- ❖ पर्यटनामुळे आर्थिक दृष्ट्या मागासलेल्या देशांना मोठ्या प्रमाणात परकीय चलन उपलब्ध होते.
- ❖ पर्यटन मोठ्या प्रमाणावर रोजगार उपलब्ध करून देते.
- ❖ आधुनिक पर्यटन व्यवसायाचा अत्यंत जलद गतीने विकास होत आहे.
- ❖ पर्यटनामध्ये होणारी वाढ जागतिक साक्षरतेत वाढ व लोकांच्या राहणीमानात वाढ घडून आणते.
- ❖ पर्यटनामुळे देशोदेशीचे लोक पर्यटन स्थळांना भेटी देतात त्यामुळे देशाची संस्कृती, इतिहास, सामाजिक, आर्थिक व राजकिय परिस्थिती जगातील इतर देशांना समजते.
- ❖ पर्यटनामुळे देशाच्या अर्थव्यवस्थेत प्रत्यक्ष करामूळे मोठ्या प्रमाणात भर पडते.

२. भागौलिक पार्श्वभूमी

२.१ स्थान व विस्तार :

चिखलदरा हे स्थान अमरावती शहराच्या वायव्येस असुन अमरावती जिल्ह्याच्या उत्तरेस आहे. २१°१५' ते २१°३०' उत्तर अक्षांश व ७७° ते ७७°३०' पुर्व रेखांशावर हे स्थान वसलेले आहे. याची समुद्रसपाटीपासुन उंची ११७७ मी आहे. चिखलदराचे भौगोलिक स्थान सातपुडा पर्वताच्या कुशीत व पायथ्याशी आहे. चिखलदरा यांच्या उत्तरेस मध्यप्रदेश तर पूर्वेस छत्तीसगड हे राज्य आहे. चिखलदरा या भागाचे एकुण क्षेत्रफळ २५०७५० चौ.किमी आहे.

२.२ भूपृष्ठरचना :

चिखलदरा हा प्रदेश बहुतांश पर्वतीय आहे. चिखलदरा येथील डोंगररांगा या वास्तविक सातपुडा पर्वतातील एक भाग आहे. येथील बराच भाग डोंगररांगांनी व्यापलेला असुन जंगल व्याप्त क्षेत्र अधिक आहे. वायव्येकडे सरासरी उंची २५००-२००० फुटापेक्षा जास्त दिसून येते. आग्नेयेकडे उंची १५००-२००० व २००० ते २५०० फुट दिसून येते. या ठिकाणी सरासरी उंची ८०० ते १००० फुटपर्यंत आढळते. जीन गडाच्या डोंगररांगा, सातपुडा पर्वताचेच तुटलेले फाटे आहे. या रांगाचा सर्वात जास्त भाग धारणी तालुक्यात दिसुन येतो. चिखलदरा हे सातपुडा पर्वताच्या गाविलगड शाखेत वसलेले आहे.

२.३ हवामान :

चिखलदराचे भौगोलिक स्थान भारताच्या मध्यस्थानापासून जवळ असल्यामुळे या ठिकाणी मोसमी हवामान प्रकार आढळतो. तसेच चिखलदरा हे ठिकाण उंचावर वसलेले असल्यामुळे येथे तापमान कमी आहे. येथे उन्हाळे कडक तर हिवाळे थंड असुन कमाल तापमान ९१० F व किमान तापमान ६८० F इतके आढळते. त्याच बरोबर जुन ते ऑक्टोंबर या कालावधीत पाऊस पडतो. वार्षिक

सरासरी पर्जन्य ३२.२ सें.मी. आहे. तर जुलैमध्ये सर्वाधीक ६५ सें.मी. पर्जन्य आढळते. येथे पावसाळ्यात बरेचदा दिवसादेखील दाट धुके आढळून येते.

२.४ मृदा :

चिखलदरा येथील जास्तीत जास्त भाग पर्वतीय असल्यमुळे याचा परिणाम येथील मृदा वितरणावर झालेला दिसतो. धारणीच्या समतल भागात तापीच्या उगम स्त्रोताकडील भागात सुपीक गाळाची जमीन आढळते. पर्वतपायथ्याच्या सुपीक प्रदेश असून पर्वत पायथ्याशी असल्यामुळेच या भागात भूमिगत पाणी मोठ्या प्रमाणात आढळते. चिखलदरा हे डोंगराळ भागात वसलेले असल्यामुळे येथे लाल व काळी मृदा आढळते.

२.५ वनस्पती :

विविध प्रकारच्या वनस्पतींनी परिपूर्ण असलेले जंगल म्हणून मेळघाटातील जंगल प्रसिद्ध आहे. या जंगलात वृक्षांच्या ९० प्रजाती, ६६ झुडूपांच्या जाती, ३१६ झाडापाल्यांच्या जाती, ५६ वेलीच्या जाती, २३ लव्हाळाच्या जाती, ९९ गवताच्या जाती आढळून येतात. त्यात सळई, मोथीन, हळद, चिंचोका, शिवन, बामुळ, धामन, सिलव्हर, ओक, साज, धावडा, निंब, बिहाडा, केकड, सागवान, चिरपाईन, तेंदु, सिसम, बिजा, कळम, मोहा, तिवस, इत्यादी वनस्पती आढळतात. तसेच तिखाडीचे गवत आणि बांबु यांचेही उत्पन्न होते.

२.६ प्राणी जगत :

मेळघाटाच्या पर्वतीय भाग प्रमाणात जंगलव्याप्त आहे. नोव्हेंबर ते फेब्रुवारी मध्ये जंगलाचे सौंदर्य बघण्याचा उत्कृष्ठ कालावधी आहे. प्राणी बघण्याचा उत्तम काळ उन्हाळा समजला जातो. उन्हाळ्यात पाणवठ्यावर प्राणी पहावयास मिळतात. मेळघाट मध्ये हरणाच्या जाती, पट्टेवाल्या खारी, शेकरू, उडत्या खारी

तालबंदा कोलकासच्या परिसरात दिसुन येतात. चिखलदरा ते सेमाडोह या रस्यातर अस्वली पाहायला मिळतात.

२.७ वाहतुक व दळणवळण :

कोणत्याही प्रदेशाच्या आर्थिक व सामाजिक विकास हा तेथील वाहतूक व दळणवळण यांच उपलब्धतेवर अवलंबून असते. अमरावती जिल्ह्यातील धारणी व चिखलदरा या तहसिल मधील वाहतूक व्यवस्थेत प्रमुख रस्ते व इतर रस्ते आढळतात.

३. पर्यटन स्थळे

३.१ मेळघाट :

अमरावती जिल्ह्यातील सातपुड्याच्या दक्षिणेकडील रांगाच्या परिसरात मेळघाट व्याघ्र प्रकल्प वसलेला आहे. १९७३-७४ मध्ये याची स्थापना करण्यात आली. येथे दक्षिण उष्ण प्रदेशीय पानझळीचे शुष्क वन हा येथील वनाचा प्रकार आहे. 'मेळघाट' या शब्दाचा अर्थच घाळाचा मेळा असा होतो. निसर्गरम्य डोंगराळ प्रदेश उंच शिखरे आणि खोल दऱ्या असणाऱ्या या जंगलातही साग वृक्ष विपुल आहेत.

परतवाडा येथे या प्रकल्पाचे मुख्यालय असुन विश्रामगृहाचे आरक्षणही येथेच होते. कोलकाज, रायपुर, माखला, तालबदा येथील विश्रामगृहात मुक्काम करता येतो.

३.२ चिखलदरा :

अमरावती जिल्ह्यातील चिखलदरा हे थंड हवेचे ठिकाण निसर्गरम्य वातावरणात लपलेल्या या प्रदेशाचा थेट महाभारताशी संबंध आहे. चिखलदरा हे स्थळ डोंगरात वसलेले आहे. या प्रदेशाचा राजा विराटचा मेव्हणा किचक याचा

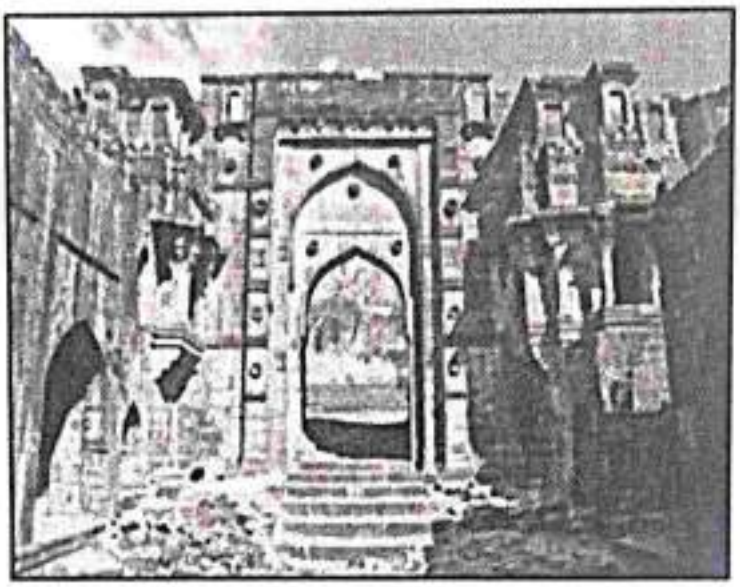
भीमाने येथे वध केला. त्या ठिकाणाला किचकदरा असे नाव पडले. कालांतराने या नावाचा अपभ्रंश होवून चिखलदरा या नावाने ओळखला जाऊ लागला.

i. **भिमकुंड :**

भिमकुंड ह्या पॉईंटला भिमकुंड हे नाव पडण्यामागे महाभारतातील आख्यायिका आहे असे म्हटल्या जाते की भिमाने किचक नावाच्या राक्षसाचा वध करून रक्ताने माखलेला हात याच दरीत धुतले म्हणून याला भिमकुंड हे नाव पडले ह्या दरीला किचक दरी नावाने ओळखले जाते. हा पॉईंट आठवणीत राहण्याचे कारण म्हणजे तेथील हिरवळ व सुंदर अशा उंचच उंच पर्वतरांगा आणि त्या पर्वतरांगामधुन ३६०० फुट उंचीवरून धो धो असा आवाज करत पडणारा धबधबा होय.

ii. **गाविलगड किल्ला :**

चिखलदरापासुन सुमारे ३ कि.मी अंतरावर गाविलगड किल्ला आहे. गवळी राजाने हा किल्ला बांधला म्हणून याला गाविलगड किल्ला म्हणतात. हा किल्ला समुद्रसपाटीपासुन ११४४ कि.मी. आहे. हा किल्ला पाहतांना प्राचीन वास्तुकलेची प्रचिती येते. या किल्ल्याला एकुण ३ दरवाजे आहेत.



iii. **पंचबोल पॉईंट :**

चिखलदऱ्यातील प्रमुख पॉईंटमध्ये येणारा हा पॉईंट असुन या पॉईंटच्या नावातच त्याचे वैशिष्ट्य दडलेले आहे. म्हणजे Five Sound येथे मोठ्याने ध्वनी दिला असता त्याचा फक्त एकच प्रतिध्वनी न येता एका पाठोपाठ एक असे पाच प्रतिध्वनी ऐकु येतात. हे ध्वनी एकानंतर एक पाच टेकड्या वरील दगडावर आदळून मोठा ध्वनी नंतर लहान लहान होत पंच ध्वनी आपल्याला ऐकु येतो हे महत्त्वाचे वैशिष्ट्ये आहे.

प्राचार्य
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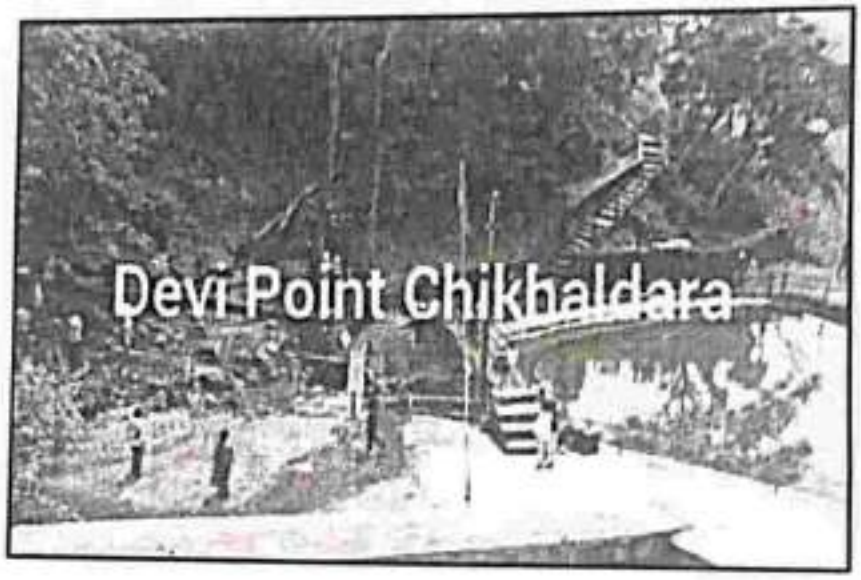
अमरावती.

iv. **देवी पॉईंट :**

चिखलदरा या पर्यटन स्थळाला भेट देतांना सर्वांना आवडणारा असा पॉईंट म्हणजे देवी पॉईंट होय. या ठिकाणी गेल्यानंतर आपल्याला देवीचे दर्शन घेता येते. त्याचप्रमाणे देवीमंदीरात उजवीकडे असणारे महादेवाचे मंदीर त्यातच साईबाबांची तसेच गजानन महाराजांची मुर्ती होती.



v. **पवनचक्की :**

पवनचक्की हे अक्षय ऊर्जा साधनांमध्ये अत्यंत महत्त्वाचे ऊर्जा साधन आहे. प्राचीन काळापासून वाऱ्याचा उपयोग जहाज वाहतुकीसाठी, पिठ गिरण्या किंवा पाणी उपसा पंप चालविण्यासाठी केला जात होता. वाऱ्याच्या गतिज शक्तीचा उपयोग करून त्यापासून विद्युत निर्मीती केल्या जाते. चिखलदरा तालुक्यातील मोथा या ठिकाणी दोन पवनचक्क्यांची भारत सरकार व्दारे उभारणी करण्यात आली. हे ठिकाण चिखलदऱ्याला येणाऱ्या पर्यटकांसाठी एक महत्त्वाचे पर्यटन स्थळ बनले आहे. या दोन्ही पवनचक्कीपासून दोन मेगावॅट विज निर्मीती होते. ही विज शहानुर प्रकल्पाला पुरविली जाते.

४. सेमाडोह

मेळघाटात धारणी तालुक्यात निसर्गरम्य वातावरणात सेमाडोह वसलेले आहे. सेमाडोह मध्ये सर्वदुर असे जंगल पसरलेले आहे. आणि हे निसर्गसौंदर्य पाहून मन अगदी प्रसन्न होते.

मेळघाटातील सेमाडोह या ठिकाणी आल्यावर निसर्गाशी आपला जवळचा संबंध प्रस्थापित होतो. निसर्गातील प्रत्येक गोष्ट आपल्याला काहीना काही शिकवत असते. गाविलगडच्या टेकड्यापासून वाहत येणारी सिपना नदी ही तापीनदीला जावून मिळते. सिपना नदी ही तापी नदीची उपनदी आहे. या भागात गोंड व कोरकु जमाती आढळून येतात यांची विशिष्ट जीवनपद्धती आढळून येते. सेमाडोह येथे असलेल्या हॉलच्या खांबावर या लोकांनी आपली सांकेतीक चिन्ह प्राणी व देवतांची चित्रे कोरल्याचे आढळून येते तसेच सेमाडोह येथे म्युझीयम आहे या संग्रहलयामुळे या भागात आढळणारे प्राणी, वनस्पती, वृक्ष, नदी, लोक यांची संपूर्ण माहिती आपल्याला मिळते.

५. कोलकास

सेमाडोह पासून जवळच निसर्गाच्या कुशीत वसलेले आणखी एक स्थळ म्हणजे कोलकास येथील शांतता अनुभवली की, याच ठिकाणी स्थायीक होण्याची इच्छा होते. शांत निसर्गरम्य परिसर उंच उंच झाडे, वनस्पती पाहत मुख्य प्रवेश व्दारातुन आत जातांना निसर्गाचा विविधतेची जाणीव होते. या कोलकासच्या मुख्य प्रवेश व्दारापासून आत १ ते २ किमी अंतरावर विश्रामगृह बांधण्यात आले आहे.

६. आर्थिक जीवन

सुगमतेच्या दृष्टीकोनातून विचार केल्यास या भागात चिखलदरा व धारणी तालुक्यातील उत्तरेकडील भागात सुगमता कमी आहे. म्हणून येथे आर्थिक जीवन विकसित दिसून येत नाही. येथील बहूतांश प्रदेश हा डोगराळ, घनदाट जंगल,

तीव्र उतार, दुर्गम प्रदेश इत्यादी कारणामुळे या भागात वाहतूकीचा प्रवास होऊ शकला नाही. त्याचप्रमाणे दळणवळणाचा विकास सुद्धा होवू शकला नाही.

या प्रदेशामध्ये जास्तीत जास्त आदिवासी जमातीचे लोक आढळून आले आहे. येथील लोक आपला उदरनिर्वाह करण्याकरीता सघन (Intensive Farming) प्रकारची शेती करतात. त्याचप्रमाणे जोड धंदा म्हणून मोहाची फुले, चारोळी, आंबा, फणस, आवळा, लाख, डिंक, सोयाबीन, भात, मिरची, कापूस इ. उत्पादने उदरनिर्वाह व व्यवसायाच्या दृष्टिने एकत्रित करतात. याशिवाय जंगलातून फळे, कंदमुळे, मध एकत्र करतात आणि ते विकून पैसा मिळवितात. त्याचबरोबर जंगलातील विविध वन औषधी मिळविणे आणि विविध वृक्षांच्या लाकडापासून कलाकुसरीच्या वस्तु, तयार करण्यात येतात, त्यापासून आपला उदरनिर्वाह करतात.

७. सामाजिक जीवन

कोरकू लोकांची एक वेगळी जीवनशैली व वेगळी संस्कृती आहे. बऱ्याच काळापासून पिढ्यानपिढ्या हे लोक मेळघाटामध्ये राहतात. कोरकूंची जीवन जगण्याची पद्धती ही सामान्य माणसापेक्षा वेगळी आहे. कोरकू लोकांमध्ये स्त्रीप्रधान संस्कृती आढळून येते. कुटुंब प्रमुख म्हणून कोरकू स्त्री काम पाहत असते. या आदिवासी लोकांची बोलीभाषा कोरकू आहे. सागाच्या वृक्षाला हे लोक सिपन म्हणतात.

कोरकू लोक एका विशिष्ट प्रकारचा पोशाख घालतात. त्यामुळे ते इतर लोकांपेक्षा वेगळे दिसतात. त्यांच्या डोक्याला नेहमी शेला बांधलेला असतो. पुरूष धोतर, विणार व दुपट्टा ही वस्त्रे अंगावर पुरूष घालतात. तर स्त्री वर्ग लुगडे घालतात. कोरकू स्त्री व पुरूष अंगावर विविध चिन्हे गोंदतात.

येथील लोक सन उत्सव मोठ्या आनंदान साजरा करतात. या लोकांचा मुख्य सन हा होळी असतो. पाच दिवस होळी हा सन साजरा केला जातो. रात्री

मोठ्या संख्येने कोरकू लोक एकत्र येतात. आनंदाने ढोलकी सुरात वाजवून पारंपारिक नृत्य करतात. पारंपारिक गाणी सुद्धा गातात.

८. निष्कर्ष

चिखलदरा, मेळघाट, सेमाडोह, कोलकास ही पर्यटन स्थळे मानवाची मनोवेधक आहे. त्यामुळे तेथे पर्यटकांचे आकर्षण मोठ्या प्रमाणात आहे. येथील पर्यटनाच्या दृष्टिकोनामधून निरीक्षण केल्यास पुढीलप्रमाणे निष्कर्ष निघतात.

- येथील प्रदेश हा डोंगर दऱ्या, दुर्गम भाग असल्यामुळे येथे वाहतूक मोठ्या प्रमाणात नाही, त्यामूळे आदिवासी जमात ही अविकसित आहे.
- या ठिकाणचे लोक मोठ्या प्रमाणात परंपरागत शेतीवर आधारित उद्योग करतात यामुळे कृषी उत्पादन कमी आहे व त्यामुळे येथील कुपोषणाचे प्रमाण जास्त आहे.
- पर्यटन स्थळ असले तरी पर्यटनाचा विकास मोठ्या प्रमाणात झालेला नाही, त्यामुळे विदेशी पर्यटक दिसून येत नाही.
- येथे येणारे बहुतांश पर्यटक एका दिवसाकरीता येतात, त्यामुळे येथील पर्यटन उद्योगाचा विकास झालेला नाही.
- पर्यटन स्थळांचे निरीक्षण केल्यावर असे आढळते की, बहुतांश स्थळांना तटबंदी बांधलेल्या नाही. त्यामुळे अपघात होण्याची भिती आहे.
- वन्यावश पर्यटन केंद्राच्या ठिकाणी पर्यटक माहिती केंद्राची गरज आहे, की ज्याव्दारे पर्यटकांना सोयी सुविधा उपलब्ध होतील.
- पर्यटकांना राहण्याकरिता निवासांची व्यवस्था मोठ्या प्रमाणात नाही त्याचवरोवर हॉटेल्सची देखील कमतरता आहे.

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अमरावती.

शैक्षणिक सहलीचा अहवाल

युवाशक्ती कला व विज्ञान महाविद्यालय अमरावती येथील वर्ष २०२१-२२ शैक्षणिक सहल दि. १९/११/२०२१ शनिवार रोजी चिखलदरा येथे नेण्यात आली. बी.ए. भाग३ मधील अभ्यासक्रमामध्ये शैक्षणिक सहलीचा सहभाग करण्यात आला आहे याचा मुख्य उदेश विध्यार्थ्यांना भोगोलिक पर्यावनासबंधी माहिती देणे हा आहे. या करिता २२ आसनाची श्रद्धा टुर्स अँड ट्रावल्स ची बस ठरवण्यात आली. या सहलीकरिता बि.ए.भाग३ चे वीस विध्यार्थी व इतर विद्यार्थी मिळून एकूण चोवीस विद्यार्थी व भूगोल विभाग प्रमुख प्रमुख प्रा. आनंद धोटे व समाजशास्त्र विभाग प्रमुख डॉ.आनंद मनवर सकाळी ८.०० अमरावती येथून प्रस्थान केले व चिखलदरा येथिल भीमकुंड , गाविलगड किल्ला , पचबोल पॉइंट, देवी पॉइंट पवनचक्की, सेमाडोहो, कोलखास इत्यादी पॉइंट पहिले.

या सहलीच्या माध्यमातून विद्यार्थांना भूपृष्ठरचना अंतरानुसारकशीबदलत जाते याची माहिती दिली तसेच हवामानामध्ये झालेला बदल समजावून सांगितला व ,त्या नुसार वनस्पती मध्ये झालेला बदल निदर्शनास आणून दिला, तसेच चिखलदरा मेळघाट परिसरामध्ये असलेली जगले त्यातील वनस्पती त्यांच्या जाती याची माहिती दिली.

मेलघाट व चिखलदरा भागामध्ये राहणाऱ्या आदिवासी जमाती व त्याची जीवनशैलीया संबंधी माहिती सुद्धा देण्यात आली.

सदर सहलीचा अहवाल विद्यार्थ्यांनी तयार केला.

प्राचार्य
युवाशक्ती कला व विज्ञान महाविद्यालय
अमरावती.

संमती पत्र

युवाशक्ती कला व विज्ञान महाविद्यालयाची येथील शैक्षणिक सहल दि. १९/११/२०२१ रोजी चिखलदरा जात आहे माझा मुलगा/ मुलगी_____

बि. ए./ बि. एसी. भाग १,२,३, मध्ये शिकत असून या सहलीला जाण्याची मी पाल्य या नात्याने सहलीमध्ये सहभागी होण्याची संमती देत आहे.

सही :_____

नाव :_____

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संमती पत्र

युवाशक्ती कला व विज्ञान महाविद्यालयाची येथील शैक्षणिक सहल दि. १९/११/२०२१ रोजी चिखलदरा जात आहे माझा मुलगा/ मुलगी_____

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सही :_____

नाव :_____

प्राचार्य
युवाशक्ती कला व विज्ञान महाविद्यालय
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भूगोल विभाग

शैक्षणिक सहल

FeedbackFrom

1) सहलीचा तुमचा अनुभव कसा आहे

अ) चांगला ब) अती चांगला क) खराब ड) अती खराब

2) सहलीचे ठिकाण कसे होते

अ) चांगला ब) अती चांगला क) खराब ड) अती खराब

3) सहलीकरिता प्रवासाकरिता केलेली वेवस्था कशी होती.

अ) चांगली ब) अती चांगली क) खराब ड) अती खराब

4) सहलीच्या माध्यमातून आपणास भोगोलिक माहिती मिळाली काय

अ) होय ब) नाही

5) भूगोल विषयाच्या प्राध्यापकांनी तुम्हाला सहलीच्या ठिकाणची भोगोलिक माहिती कशी दिली

अ) चांगली ब) अती चांगली क) खराब ड) अती खराब

6) एकंदर सहलीस तुम्ही किती गुण दयाल

अ) जास्त ब) कमी क) अती कमी ड)अती जास्त

7) सहलीवर तुम्ही अहवाल तयार कराल काय

अ) होय ब) नाही

8) सहली समंधी आपला अभिप्राय थोडक्यात मांडा.

_____

_____

नाव _____

वर्ग _____

सही _____

प्राचार्य
युवाशक्ती कला व विज्ञान महाविद्यालय
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Year 2021-22

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Study Tour or Socio-Economic Field Survey

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2	Vijay Shesdrao Pawar	B. A. III	Pawar
3)	Yasin Anjir Kedar	B. A. III	Yasin
4)	Sanket Pramod Kene	B. A. III	S.P. Kene
5)	Gunjan Bhatu Doesimbe	B.A. III	Doesimbe
6)	Harshad Bipin Pale	B. A. III	
7	Akash Imam Suratne	B.A. III	Akash
8	Harshadip Fakira Suratne	B. A. III	
9	Anil Haridas Surtatne	B.A. III	anilharidas.
10	Vishal Kundlik Bele	B. A. III	V Bele
11	Arjun uttam adhav	B.A. III	Adhav
12	Dipak Prakash Chavhan	B.A. III	Dipak
13	Akash gajanan Thakre	BA III	Akash
14	Shubham Dhanraj Kale	B. A. III	Shubham Dhan
15)	pravin Haricharan Doeshinde	B.A. III	Pravin Doeshinde

प्राचार्य
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17	Ramdev Janakkalyaanrokar	B.A. III	Ramdev
18	Gaurav Sanjayrao Sawlikar	B.A. III	G. S. Sawlikar
19	Dipak Motilal sokam	B.A. III	Dipak Sokam
20	Kamlesh Arun Dhurve	B.A. III	Kamlesh Dhurve
21	Ashwini sudhakar Gurnule	BA. II	Ashwini ☺.
22	Vishal Pratap Kathale	BA. II	Vishal Kathale
23	Shrikrushna Dipak Kale	BA. I	Shri Kale.
24	yogesh shrirram Kale	B.A. I	yogesh Kale.

Yuvashakti Arts & Science College Amravati

प्राचार्य
युवाशक्ती कला व विज्ञान महाविद्यालय
अमरावती.

Yuvashakti Arts & Science College , Amt

DEPARMENT OF PHYSICS

(B.sc. second Year) 2021-2022

Project on

" ELECTOMAGNETIC INDUCTION "

Presentation by

TUSHAR D. GADEKAR

AJAY P. JEWDE

AKSHAY P. HARDE

SARVESH N. TAK

ASHUTOSH S. MALVE

RUSHIKESH M. BHUYAR

Guided By

Prof. Miss P.B.Khandekar

Principal
Yuvashakti Arts & Science College
Amravati

CERTIFICATE

This is to Certify that Project Report entitled

" ELECTROMAGNETIC INDUCTION "

Has been duly completed by following student in satisfactory manner under my guidance as a partial fulfillment for practical in B.sc . second year (Physics) University of Amravati

Presentation by

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Department of physics
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2021-2022

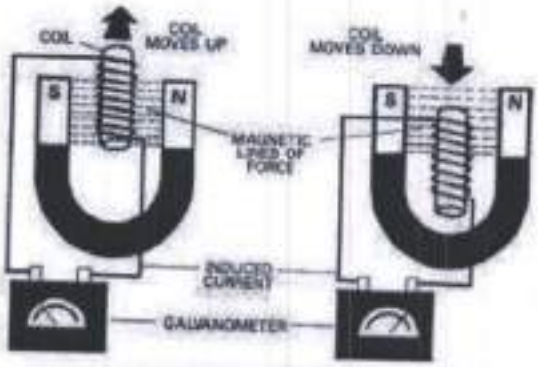
Principal
Yuvashakti Arts & Science College
Amravati

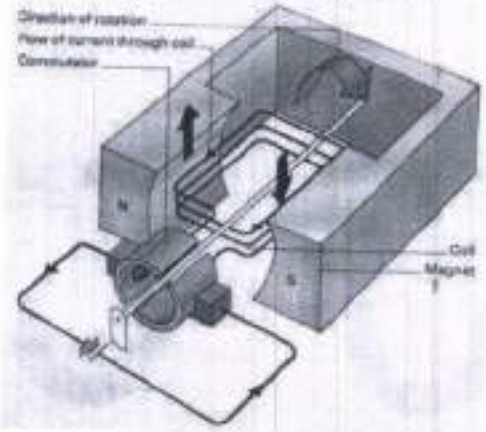
CONTENT :-

PROJECT

ELECTROMAGNETIC INDUCTION

The phenomenon of electromagnetic induction





Introduction:

Electro Magnet: An electromagnet is a type of magnet in which the magnetic field is produced by electric current. The magnetic field disappears when the current is turned off.

Induction: This process of generating current in a conductor by placing the conductor in a changing magnetic field is called induction.

Electromagnetic Induction: Electromagnetic induction is the production of a potential difference (voltage) across a conductor when it is exposed to a varying magnetic field. Electromagnetic induction is when an electromagnetic field causes molecules in another object to flow. Induction can produce electricity (in coils), heat (in ferrous metals), or waves (in a radio transmitter). Finally it is refers to the phenomenon where an emf is induced when the magnetic flux linking a conductor changes. Magnetic Flux is defined as the product of the magnetic flux density and the area normal to the field through which the field is passing. It is a scalar quantity and its S.I. unit is the weber (Wb).

$\varphi = BA$

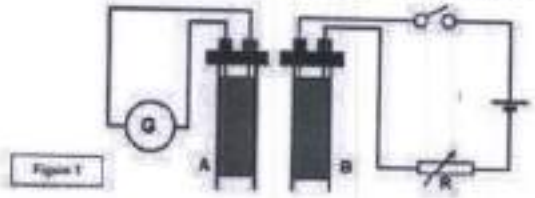
Principle:

Electromagnetic induction (or sometimes just induction) is a process where a conductor placed in a changing magnetic field (or a conductor moving through a stationary magnetic field) causes the production of a voltage across the conductor. This process of electromagnetic induction, in turn, causes an electrical current – it is said to induce the current

Theory:

Invention:

Michael Faraday is generally credited with the discovery of induction in 1831 though it may have been anticipated by the work of Francesco Zantedeschi in 1829. Around 1830 to 1832, Joseph Henry made a similar discovery, but did not publish his findings until later Induced e.m.f.s: If magnetic flux through a coil is altered then an e.m.f. will be generated in the coil. This effect was first observed and explained by Ampere and Faraday between 1825 and 1831. Faraday discovered that an e.m.f. could be generated either by, (a) moving the coil or the source of flux relative to each other or by (b) changing the magnitude of the source of magnetic flux in some way. Note that the e.m.f. is only produced while the flux is changing. For example, consider two coils as shown in Figure 1.

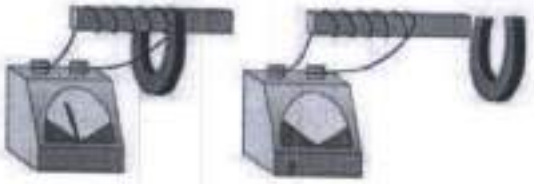


Coil A is connected to a galvanometer and coil B is connected to a battery and has direct current flowing through it. Coil A is within the magnetic field produced by B and an e.m.f. can be produced in A by moving the coils relative to each other or by changing the size of the current in B. This can be done by using the rheostat R, switching the current on or off, or (c) using an a.c. supply for B. (An e.m.f. could also be produced in coil A by replacing coil B with a permanent magnet and moving this relative to coil A.)

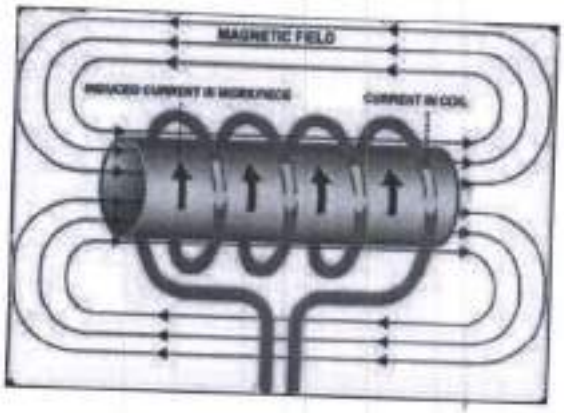
Representation:

Electromagnetic induction is the production of a potential difference (voltage) across a conductor when it is exposed to a varying magnetic field. Working and Construction: Current is produced in a conductor when it is moved through a magnetic field because the magnetic lines of force are applying a force on the free electrons in the conductor and causing them to move. This process of generating current in a conductor by placing the conductor in a changing magnetic field is called induction.

This is called induction because there is no physical connection between the conductor and the magnet. The current is said to be induced in the conductor by the magnetic field. One requirement for this electromagnetic induction to take place is that the conductor, which is often a piece of wire, must be perpendicular to the magnetic lines of force in order to produce the maximum force on the free electrons. The direction that the induced current flows is determined by the direction of the lines of force and by the direction the wire is moving in the field. In the animation above the ammeter (the instrument used to measure current) indicates when there is current in the conductor.

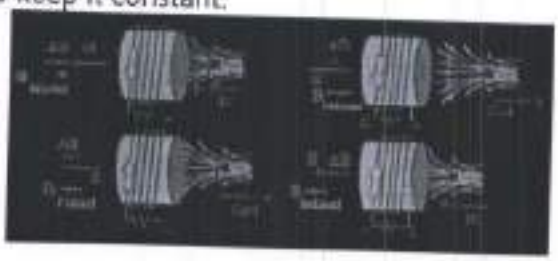


If an AC current is fed through a piece of wire, the electromagnetic field that is produced is constantly growing and shrinking due to the constantly changing current in the wire. This growing and shrinking magnetic field can induce electrical current in another wire that is held close to the first wire. The current in the second wire will also be AC and in fact will look very similar to the current flowing in the first wire. It is common to wrap the wire into a coil to concentrate the strength of the magnetic field at the ends of the coil. Wrapping the coil around an iron bar will further concentrate the magnetic field in the iron bar. The magnetic field will be strongest inside the bar and at its ends (poles).



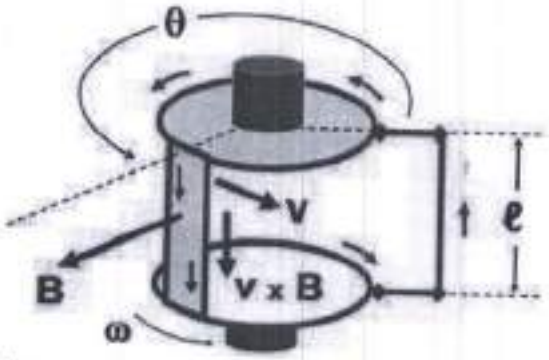
Lenz's Law:

When an emf is generated by a change in magnetic flux according to Faraday's Law, the polarity of the induced emf is such that it produces a current whose magnetic field opposes the change which produces it. The induced magnetic field inside any loop of wire always acts to keep the magnetic flux in the loop constant. In the examples below, if the B field is increasing, the induced field acts in opposition to it. If it is decreasing, the induced field acts in the direction of the applied field to try to keep it constant.



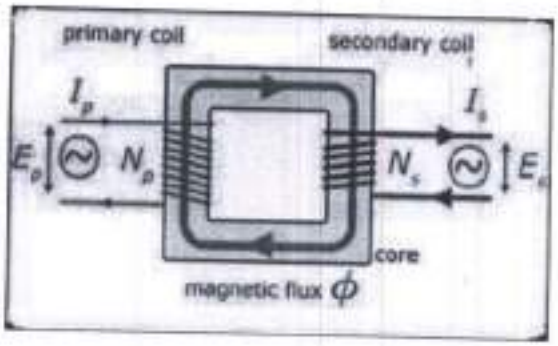
Applications of electromagnetic Induction Electrical Generator:

The EMF generated by Faraday's law of induction due to relative movement of a circuit and a magnetic field is the phenomenon underlying electrical generators. When a permanent magnet is moved relative to a conductor, or vice versa, an electromotive force is created. If the wire is connected through an electrical load, current will flow, and thus electrical energy is generated, converting the mechanical energy of motion to electrical energy



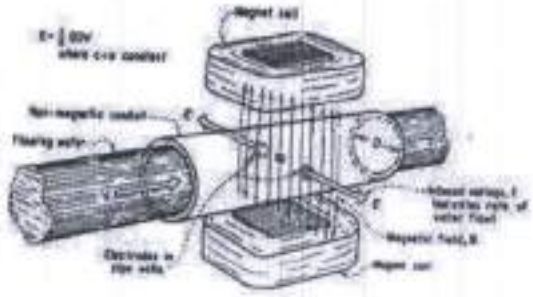
Electrical transformer

The EMF predicted by Faraday's law is also responsible for electrical transformers. When the electric current in a loop of wire changes, the changing current creates a changing magnetic field. A second wire in reach of this magnetic field will experience this change in magnetic field as a change in its coupled magnetic flux, d ΦB / d t. Therefore, an electromotive force is set up in the second loop called the induced EMF or transformer EMF. If the two ends of this loop are connected through an electrical load, current will flow.

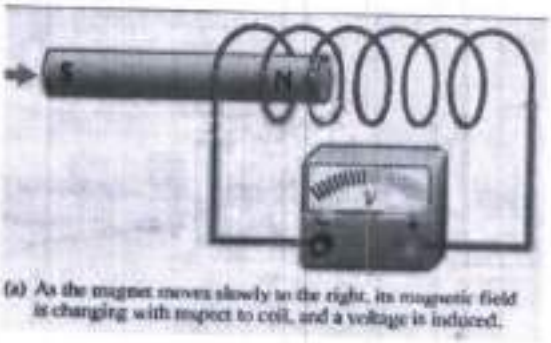


Magnetic flow meter: Faraday's law is used for measuring the flow of electrically conductive liquids and slurries. Such instruments are called magnetic flow meters. The induced voltage ℰ generated in the magnetic field B due to a conductive liquid moving at velocity v is thus given by:

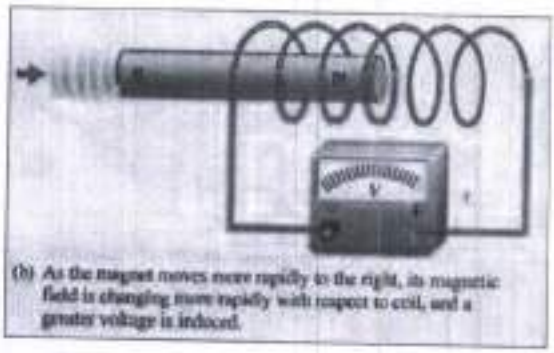
ℰ = -Blv where ℓ is the distance between electrodes in the magnetic flow meter.



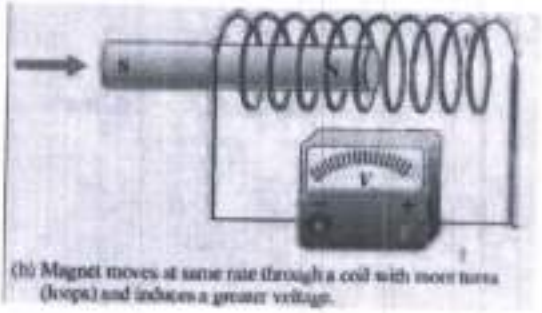
Observation:



(a) As the magnet moves slowly to the right, its magnetic field is changing with respect to coil, and a voltage is induced.



(b) As the magnet moves more rapidly to the right, its magnetic field is changing more rapidly with respect to coil, and a greater voltage is induced.



(b) Magnet moves at same rate through a coil with more turns (loops) and induces a greater voltage.

Conclusion:

Faraday's Law of Electromagnetic Induction, first observed and published by Michael Faraday in the mid-nineteenth century, describes a very important electro-magnetic concept. Although its mathematical representations are cryptic, the essence of Faraday's is not hard to grasp: it relates an induced electric potential or voltage to a dynamic magnetic field. This concept has many far-reaching ramifications that touch our lives in many ways: from the shining of the sun, to the convenience of mobile communications, to electricity to power our homes. We can all appreciate the profound impact Faraday's Law has on us.

The principles of electromagnetic induction are applied in many devices and systems, including:

- Electrical generators
- Induction motors
- Induction sealing
- Inductive charging
- Transformers
- Wireless energy transfer

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DEPARMENT OF PHYSICS

(B.sc. second Year) 2021-2022

Project on

" UNDERSTANDING NEGATIVE INDEX METAMATERIALS "

Presentation by

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GAURAV V. NIMKAR

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CERTIFICATE

This is to Certify that Project Report entitled

" UNDERSTANDING NEGATIVE INDEX METAMATERIALS "

Has been duly completed by following student in satisfactory manner under my guidance as a partial fulfillment for practical in B.sc . second year (Physics) University of Amravati

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CONTENTS

1. INTRODUCTION

In optics, the refractive index (R.I.) of a material is conventionally taken to be a measure of optical density and is defined as

$$n = \frac{c}{v},$$

where c is the velocity of light in vacuum and v is the velocity of the electromagnetic plane wave in the medium.

From Maxwell's equation, we have

$$n^2 = \sqrt{s\mu}$$

This implies

$$n = \pm\sqrt{s\mu},$$

where ε is the relative permittivity and μ is the relative permeability of the medium.

Naturally occurring materials has n= +ve value and they are termed as Positive Index Materials (PIM) or Right Handed Materials (RHM). But for the case where ε<0 and μ<0, Vaselago in 1967 [1] proposed that

$$n = \sqrt{(-s)(-\mu)}$$

$$= \sqrt{se^{i\pi}}\sqrt{\mu e^{i\pi}}$$

$$= -\sqrt{s\mu}$$

Such materials with simultaneous negative values of both ε and μ so that we can have refractive index negative at overlapping frequencies are known as Negative Index Metamaterials (NIMs) also known as Negative Refractive Material (NRM) or Left Handed Materials (LHM). Since ε and μ are dispersive it is necessary to take into account that n depends on frequency otherwise the energy of the field given by

$$W = \varepsilon E^2 + \mu H^2,$$

will be negative when ε and μ are negative , which is impossible. When frequency dispersion exists the energy W must be given in a different manner:

$$W = \frac{\partial(\varepsilon\omega)}{\partial\omega} E^2 + \frac{\partial(\mu\omega)}{\partial\omega} H^2,$$

which is positive for a very broad class of dispersion equations for $\varepsilon(\omega)$ and $\mu(\omega)$ [2].

All causal materials are dispersive which means ε and μ are complex functions of the frequency. They are negative below the plasma frequency,

$$\varepsilon(\omega) = 1 - \frac{\omega_p^2}{\omega^2},$$

and

$$-\frac{\omega_m^2}{\omega^2}\mu,$$

where ω_p and ω_m are the electric and magnetic plasma frequency. However the approach towards absorptive resonances at lower frequencies increases the dissipation and hence their complex nature. So far there is no such material found in nature but its artificial fabrication is possible. Such materials are found to exhibit various strange phenomena. The interest in this field increases due to the possibility of superlens production using NIMs. It is also found that soliton can be formed when electromagnetic waves propagate through NIMs which will be a boon in the field of communication.

1.1. *CLASSIFICATION OF ELECTROMAGNETIC MATERIALS*

The electromagnetic (EM) response of a medium is determined by the values of ε and μ of that medium. Based on the relative signs of these two, the EM materials can be classified into four types in shown in figure (1) below.

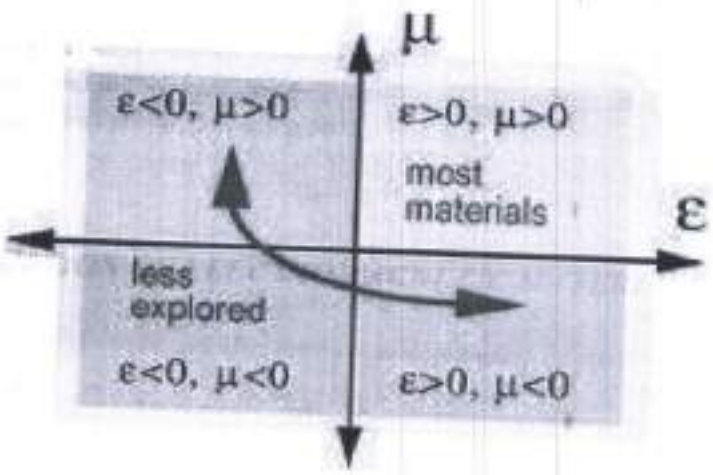

Fig (1): Re (ϵ) vs Re (μ) plane classifying em materials.

First quadrant- This corresponds to the normal material with $\epsilon>0$ and $\mu>0$. In such material we have propagating waves.

Second quadrant- $\epsilon<0$ and $\mu>0$ is the electric plasma material and here we get evanescent decaying waves. This material can support a host of resonant states localized at the surface known as surface plasmons.

Third quadrant- $\epsilon<0$ and $\mu<0$ is the artificial NRM where we obtain propagating waves.

Fourth quadrant- $\epsilon>0$ and $\mu<0$ .This is the magnetic plasma material in which evanescent waves are obtained and can also support surface plasmons.

Our aim is to make a material of third quadrant using a composite of second and fourth quadrant materials over a common frequency range.

1.2 PROPERTIES OF NIMS WHICH MAKE THEM DIFFERENT FROM NORMAL MATERIAL

To study the electrodynamics of NIMs [1] which make them counter intuitive w.r.t the normal material let us consider the Maxwell's curl equations,

$$\bar{\nabla} \times \bar{E} = -\frac{1}{c}\frac{d\bar{B}}{dt} \qquad (1.2a)$$

$$\bar{\nabla} \times \bar{H} = \frac{1}{c}\frac{d\bar{D}}{dt} \qquad (1.2b)$$

(a) For a plane harmonic wave $e^{i(kx-\omega t)}$ (1.2a) and (1.2b) reduce to

$$k \times \bar{E} = \omega\mu\mu_0\bar{H}$$

$$\bar{k} \times \bar{H} = -\omega\epsilon\epsilon_0\bar{E}$$

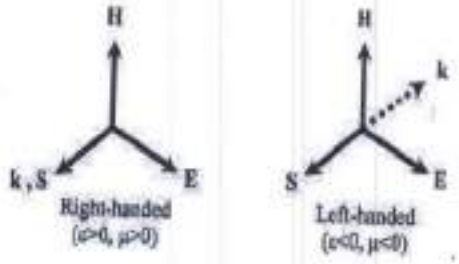

Fig (2): right handed and left handed triad

For a medium with negative real parts of ϵ and μ with imaginary parts negligibly small $\vec{E}$, k and $\vec{H}$ form a left-handed triple of vectors whereas they form a right handed triple in normal materials.

(b) Poynting vector, $\vec{S} = \vec{E} \times H$ and

$$\vec{k} = \frac{n\omega}{c}\hat{n},$$

where $\hat{n}$ is a unit vector along $E \times \vec{H}$. This shows that $\vec{S}$ and $\vec{k}$ are parallel for $n > 0$ and antiparallel for $n < 0$. Thus in NIMs, waves propagate in a reverse phase. We also know that the phase velocity of the wave coincides with the direction of k and group velocity with $\vec{S}$. Therefore $\vec{S}$ is antiparallel to phase velocity in NIMs which means the phase wavefronts move backward.

(c) Group velocity, v_g is opposite to phase velocity, v_p in LHM.

Since
$$v_p = \frac{\omega}{k}\hat{k}$$
$$= \frac{\omega c}{n\omega}\hat{k}$$

Phase velocity in LHM is opposite to that in RHM. In linear, isotropic non dissipative media, group velocity is equal to the energy flow velocity associated with $\vec{S}$ which does not depend on material properties.

Hence for LHM phase velocity and group velocity are of opposite sign and wavefront travels towards the source.

1.3. FABRICATION OF NIMs

In nature we do not find any material exhibiting negative refraction at any frequency. But the theoretical implications suggest various useful applications for such material. So NIMs are artificially fabricated for the first time in the year 2000 and the fabrication consists of making a composite of an array of thin wires showing negative permittivity and split ring resonators (SRR) with negative permeability such that it has artificially designed arrays of LC oscillators mounted on electronic circuit plates capable to interact with em fields with frequency around 10 GHz. Graphing the general dispersive curve for SRRs, a region of propagation occurs from 0 up to a lower band edge followed by a gap and then an upper passband. When wires are symmetrically added between the splits rings a passband occurs within the forbidden gap.

Fig (3): composite of thin wire and SRRs

Most materials exhibiting a good electrical response can be found at almost any frequency from radiofrequency to ultraviolet frequencies but the magnetic response of most materials is limited to low microwave frequency as the magnetic polarization usually results from either unpaired electron spins or orbital electron currents. Therefore the collective excitations of these usually tend to occur at low frequency (microwave).

Let us study these components separately.

Thin wire medium: Mesh wire structures which consist of composites of randomly oriented long conducting fibers have been known to exhibit very high values of permittivity even at low concentration. Effective medium theories describe these systems when the wavelength of the

incident radiation is much larger than the intrinsic length scales of the structure. However the radiation probes only the end surfaces of the metallic structures and hence it is hard to make it penetrate well into the bulk of the structure for the appearance of three dimensional effective medium to hold true in many cases. Pendry et al [3] and Sievenpiper [4] independently demonstrated that metallic wire-mesh structures have a low frequency stop band from zero frequency up to a cut off frequency which they attributed to the motion of electrons in the metal wires and therefore we can obtain a negative dielectric at low frequency.

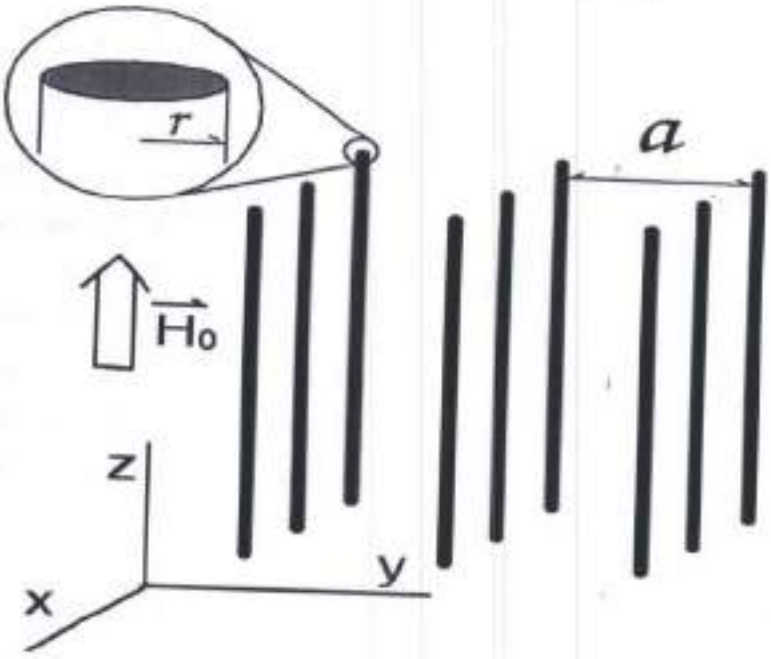

Fig (4): wire-mesh metallic structure as effective negative permittivity medium

By inherent property of thin wire medium, it has negative permittivity at frequencies below plasma frequency. Due to spatial confinement of the electrons to thin wires, the effective electron concentration in the volume of the structure is reduced which also decreases the plasma frequency. Thus an array of thin metallic wires by virtue of its macroscopic plasma like behaviour produces an effectively negative permittivity at microwave frequency.

For obtaining negative permittivity we exclude sphere and disc type media since the finite dimensions of these conducting inclusions transverse to applied field make the effective medium a diamagnetic response.

DISPERSION RELATION FOR PERMITIVITY ε (ω)

The dispersion relation is obtained using Drude-Lorentz model [5] as discussed below. The free electrons of conductors are considered to as negatively charged plasma. The long wavelength dielectric response ε (ω) of an electron gas is obtained from the equation of motion in an electric field.

$$m\ddot{x} = -eE$$

If x and E have time dependence e^{-iwt}, then

$$-\omega^2 m x = -e E$$

$$\Rightarrow \quad x = \frac{E}{m\omega^2}$$

The dipole moment of one electron is

$$-e x = -\frac{e^2}{m\omega^2}$$

The polarization defined as dipole moment per unit volume is

$$P = -ne x$$

$$= \frac{e^2}{m\omega^2} E,$$

where n is electron concentration.

Since we know that, $\varepsilon(\omega) = \frac{D(\omega)}{E(\omega)} = 1 + 4\pi \frac{P(\omega)}{E(\omega)}$

$$\Rightarrow \varepsilon(\omega) = 1 \quad \left(-\frac{ne^2}{m\omega^2}\right) \text{(c.g.s)}$$

or $$\varepsilon(\omega) = 1 - \frac{e^2}{\varepsilon_0} \frac{n}{m\omega^2} = 1 - \frac{\omega_p^2}{\omega^2} \qquad (1)$$

If we consider the dissipation into account the relation is

$$\varepsilon(\omega) = 1 - \frac{e^2}{\varepsilon_0} \frac{n}{(\omega + i\gamma)};$$

γ is the damping or dissipation factor.

This is the dispersion relation for $\varepsilon(\omega)$ and it is negative for $\omega < \omega_p$ (plasma frequency).

Plasma frequency is defined by the relation

$$\omega_p^2 = ne^2/\varepsilon_0 m \quad \text{or} \quad \omega_p^2 = 4\pi ne^2/m$$

Split Ring Resonator (SRR): It consists of two rings with oppositely oriented splits. The splits in the rings are responsible for resonance at wavelengths much larger than the diameter of the rings [6]. The second split is oppositely oriented to generate a large capacitance at the small gap. With a single split a large electric dipole moment will be generated across the capacitive gap and this could well dominate over the weaker magnetic dipole moment generated in the ring. When there are two oppositely oriented splits, the dipole moment across opposite splits cancel each other and one only gets weak electric quadrupole moment whose effects can be dominated by the magnetic dipole moment. The periodic array of SRRs allows material to behave as a medium with effective μ at resonance since the incident wavelength cannot sense each individual unit. What we get is a response average over all the units. It works on the principle that a magnetic flux penetrating the metal rings will induce rotating currents in the rings which produce their own flux enhancing or opposing the incident field depending on the spin. This field pattern is dipolar.

Fig (5): SRR

The magnetic flux produced can be understood as magnetic response. In other word, we can say that when an alternating magnetic field is applied perpendicular to the plane of split ring resonator,

it behaves like a magnetic driven LC circuit exhibiting a resonance response at frequency Ω_m associated with the resonant circular currents in the SRR.

Where,

$$\Omega_m = \frac{1}{\sqrt{LC}}$$

This resonant circular currents give rise to a resonant magnetic dipole moment thereby we can recognize a SRRs system as a resonant effective permeability.

DISPERSION RELATION FOR PERMEABILITY $\mu(\omega)$

Consider the SRRs to be placed in a square lattice of lattice constant, a. In a SRR assuming the gap to be very small compared with the radius (r) and that the capacitance due to the large gaps in any single ring is negligible, we balance emf around the circuit with the ohmic drop in potential (Lenz Law).

By Lenz Law,

$$-\frac{d\phi}{dt} = -\frac{d}{dt}\int B.ds = \int E.dl - \frac{j}{i\omega c}$$

$$\Rightarrow i\omega\mu_0 \pi r^2 (H_0 + j - \frac{\pi r^2}{a^2} j) = 2\pi r \rho j - \frac{j}{i\omega c}$$

Here we use,

$B = \mu_0 H$ and $j = \sigma E$

$H = H_0 + j - \frac{\pi r^2}{a^2} j$, is the axial magnetic field inside the SRR

H_0 = applied magnetic field, j = induced current per unit length.

And third term is the depolarizing field due the induced current. ρ is the resistance per unit length.

$C = \frac{\varepsilon_0}{3d} s\pi r^2$ is the effective capacitance with ε as the relative dielectric permittivity of the material in the gap, d. Now for a homogeneous system of SRRs the effective magnetic field

$$H_{eff} = H_0 - \frac{\pi r^2}{a^2} j.$$

Then $B_{eff} = \mu_0 H_0$

$$\mu_{eff} = \frac{B_{eff}}{\mu_0 H_{eff}}$$

Solving we get,

$$\mu_{eff} = 1 - \frac{\pi r^2 / a^2}{1 - (3d / \mu_0 \omega^2 g^2 r^3) + i(2\rho / \mu_0 \omega r)}$$

$$= 1 + \frac{f\omega^2}{\omega_0^2 - \omega^2 - iF\omega}$$

Here $\omega_0 = \sqrt{\frac{3d}{\mu_0 \omega^2 g^2 r^3}}$ is the resonant frequency and $f = \frac{r^2}{a^2}$ is the filling fraction of the material.

For frequencies larger than ω_0, the response is out of phase with the driving magnetic field and μ_{eff} is negative upto the magnetic plasma frequency given by

$$\omega_m = \sqrt{\frac{3d}{(1-f)\mu_0 \omega^2 g^2 r^3}} \qquad (2)$$

TO SHOW NIMs WORK IN MICROWAVE REGION

Using the dispersion relation,

$$\epsilon = 1 - \frac{\omega_p^2}{(\omega + i\gamma)}$$

Where, γ = damping factor and ω_p = plasma frequency.

For small damping $\gamma = 0$, from (1) we get

$$\epsilon = 1 - \frac{\omega_p^2}{\omega^2} \text{ and } \omega_p = \frac{ne^2}{m\epsilon_0}$$

For density of plasma (n) in the wires ~10^{17} /m^3

And putting the values of m= mass of electron, e = 1.6×10^{-19} C

$$\epsilon_0 = 8.85 \times 10^{-12} \text{ N } m^2 C^{-2}$$

We get $\omega_p \sim 10^{10}\ s^{-1}$ which corresponds to wavelength ~ 10^{-2} m i.e in the microwave region.

For ε to be negative $\omega < \omega_p$ and it is possible in the microwave region.

Similarly in (2) if we put the values of r = 1.5 mm, a = 5 mm, d = 0.2 mm we have a resonant frequency in the microwave region where μ is negative.

1.4. PHENOMENA EXHIBITED BY NIMs

Some of the strange phenomena exhibited by NIMs are discussed as below.

(a) Reversed Snell's Law

According to Snell's Law,

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

Where $n_1 and\ n_2$ are the refractive indices (R.I) of the rarer medium and denser medium and θ_1 , θ_2 are the angles of incidence and refraction respectively. When both n_1 *and* n_2 are positive refracted ray is on the opposite side of the normal while it is refracted on the same side of normal when $n_1 > 0$ but $n_2 < 0$ as shown in figure 6 below.

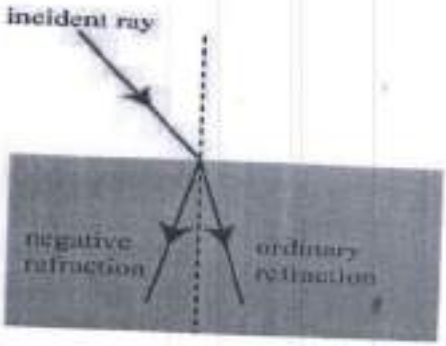

Fig (6): diagram shows positive and negative refraction

When $n_1 > 0$ but $n_2 < 0$ modified Snell's Law becomes

$$n_1 \sin\theta_1 = -\sin\theta_2$$

$$n_1 \sin\theta_1 = \sin(-\theta_2)\ ,$$

and hence the negative refraction.

(b) Reversed Doppler Effect

In Doppler Effect the frequency of a source increases or decreases when a detector is moving towards or away from it. But the thing is reversed in case of Reversed Doppler Effect.

Suppose if a source emits radiation at frequency ω and a detector is moving w.r.t source at velocity v, then the frequency received by the detector is given by

$$= \gamma (\omega + \bar{k} v)$$

$$= \frac{1}{\sqrt{c^2 - v^2}} \omega \left(1 + \frac{nv}{c}\right) \text{ where } \bar{} = \frac{n\omega}{c}$$

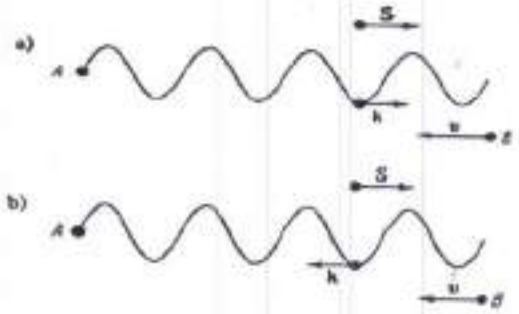

Fig (7): Doppler Effect in a right-handed substance; b) Doppler Effect in a left-handed substance. The letter A represents the source of the radiation, the letter B the receiver.

If n = +1,

$$\omega = \omega \sqrt{\frac{c \pm}{c - v}}$$

But for NRM, $\bar{k}$ has negative sign since n (refractive index) is negative and

$$\omega = \omega \sqrt{\frac{\quad}{c + v}}$$

Thus the frequency received by the detector will increase as the source is receding from it and vice versa.

(c) Obtuse angled Cherenkov's radiation

Cherenkov radiation is the cone of electromagnetic radiation when a charge particle such as electron passes through a dielectric medium at a speed greater than the phase velocity of light that medium. The charged particles polarize the molecules of the medium which then turn back rapidly to their ground state emitting radiation in the process.

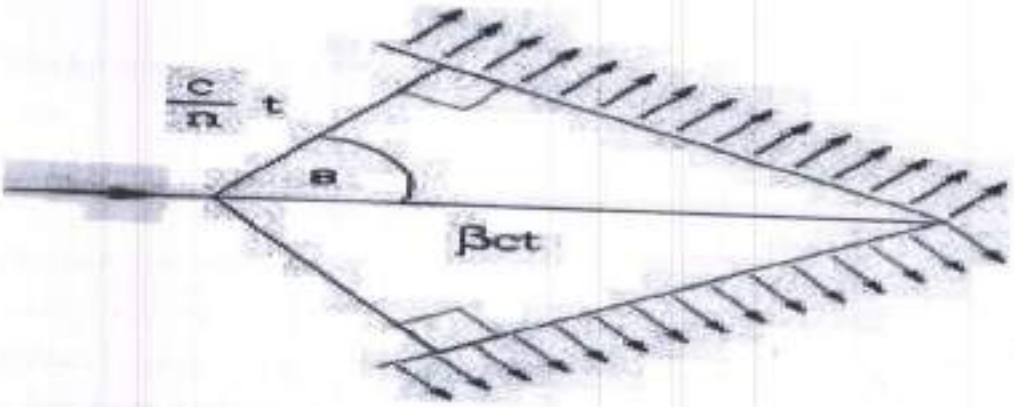

Fig (8): Cherenkov radiation.

Suppose at time t = 0, charge particle is situated at left hand corner of the diagram and traverses to the right corner with velocity phase velocity equal to βc in time t as shown in fig. 8 above. Distance traversed will be equal to βc t. If n is the R.I of the medium the cone will have traversed a distance $\frac{c}{n}$t. Hence the acute angle of this cone is given by,

$$\cos\theta = \frac{c/n}{\beta c} = \frac{1}{\beta n}$$

For positive value of n, θ is acute while for the case of NRM n is negative and hence we will have radiation from a cone of obtuse angle.

1.5. THEORY OF DIFRACTION LIMIT

Consider an object and a lens placed along the z-axis so that the rays from the object are travelling along the z direction. The field emanating from the object can be written in terms of superposition of plane waves.

$$(x, y, z, t) = \sum_{k_x k_y} (k_x, k_y) e^{i(kxx+kyy+kzz-\omega t)}$$

Where,

$$k_z = \sqrt{\frac{\omega^2}{c^2} - (k_x^2 + k_y^2)}$$

Only positive square root is taken as the energy is going in the +z direction. All the components of the angular spectrum of the image for which k_z is real, are transmitted and refocused by an ordinary lens.

However if $k_x^2 + k_y^2 > \frac{\omega^2}{c^2}$ (higher resolution case), then k_z becomes imaginary and the wave is an evanescent wave whose amplitude decays as the wave propagate along the z- axis. The result is the loss of high frequency components of the wave which contain information about the high frequency features of the object being imaged. The highest resolution that can be obtained in a conventional lens is

$$k_{max} \quad \frac{\omega}{c} = \frac{2\pi}{}$$

$$\therefore x_{min} \quad \lambda$$

If the lens is placed at a distance larger than the operating wavelength, λ then k_z component will not be seen. In Pendry's Perfect lens, the transport of energy in the +z direction requires k_z to have opposite sign.

$$k_z = -\sqrt{\frac{\omega^2}{c^2} - (k_x^2 + k_y^2)}$$

For large angular frequencies, the evanescent waves grows so with proper lens thickness, all components of the angular spectrum can be transmitted through the lens undistorted. Thus the perfect lens is capable of capturing the near field components.

2. APPLICATIONS

2.1. PERFECT LENS

We consider a Vaselago's perfect lens [1] which consists of a slab of NRM with $\epsilon = -1$ and $\mu = -1$ capable of focusing both the propagating and evanescent waves emitted by an object.

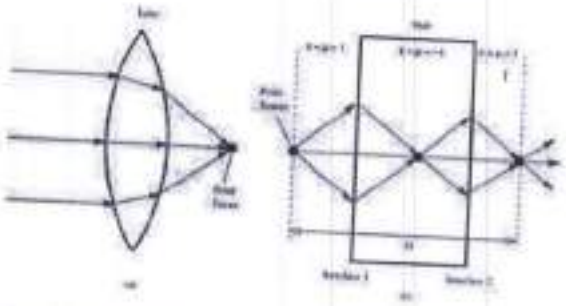

Fig 9 (a): Conventional lens Fig 9 (b): perfect lens

When an object is placed in front of an material with $n = -1$, the waves are refracted so that they focus once inside the lens and once outside it. Such refraction allows for sub-wavelength resolution. Hence a perfect lens allows the near field rays to occur once within the lens and once outside enabling sub-wavelength imaging.

Inside the perfect lens, the amplification of the evanescent waves take place by producing excited states at the NRM surfaces. For this the surface current matches the evanescent waves from the object. We can mathematically show it using Pendry's Proposal.

Consider a Vaselago's lens consisting of a slab of thickness d with $\epsilon = -1$ and $\mu = -1$ surrounded by vacuum as shown in figure above. Source is at $z = 0$ (object plane). We are to calculate the fields at $z = 2d$ (image plane).

The transmission and reflection coefficients at the interfaces are

$$T=\frac{t_{21}t_{32}e^{ik_{z2}d}}{1-r_{12}r_{21}e^{2ik_{z2}d}}$$

$$R=\frac{r_{23}+r_{32}e^{2ik_{z2}d}}{1-r_{12}r_{21}e^{2ik_{z2}d}}$$

When NRM has $c_- = -c_+ = -1, \mu_- = \mu_+ = -1$, we obtain trivially for propagating waves $k_{z2} = -k_{z1}$, $t_{jk} = 1$ and $r_{jk} = 0$ due to matched impedance.

$$\lim_{\substack{\varepsilon_-\to-1\\ \mu_-\to-1}} = -ik_{z1}d$$

And

$$\lim_{\substack{\varepsilon_-\to-1\\ \mu_-\to-1}} R = 0$$

This clearly shows that the total phase change for propagation from the object plane to the image plane is zero.

For evanescent waves with $k_{z1} = i\sqrt{k_x^2 + k_y^2} - c_{+\mu} + \frac{\omega^2}{z}$

$$= ik_z$$

Then $k_{z2} = k_{z1}$ and the partial coefficients t_{jk} and r_{jk} diverge.

However the transmission and the reflection coefficients of the slab are still well defined in this limit.

$$\lim_{\substack{\varepsilon_-\to-1\\ \mu_-\to-1}} = k_z d$$

$$\lim_{\substack{\varepsilon_-\to-1\\ \mu_-\to-1}} R = 0$$

i.e the slab actually increases exponentially the amplitude of the evanescent wave at the same rate by which it decays in free space.

Differences between conventional and perfect lens

Conventional lens	Perfect lens
(a) Its resolution is limited by the diffraction limit.	(a) Its resolution is not subjected to the diffraction limit.
(b) It focuses only the propagating wave of the electromagnetic radiation.	(b) It can focus both the propagating and evanescent waves of the electromagnetic radiation.
(c) A convex lens shows a converging nature and a concave lens a diverging one.	(c) A concave lens shows a converging nature and a convex lens a diverging one.

2.2. CLOAKING

The phenomenon of concealing an object from view is called cloaking. The principle of cloaking was first achieved in the microwave frequency on Oct 19, **2006**. An object is made invisible by covering it with a metamaterial cloak due to its ability to deflect the electromagnetic radiation. The radiation flows around the object as if nothing were there at all. We know that the bending of light is determined by refractive index. Metamaterials have a gradient in refractive index since it is inhomogeneous. The existence of this gradient in NIMs makes possible the creation of cloaking devices. Moreover the bending of light can be explained by Transformation Optics.

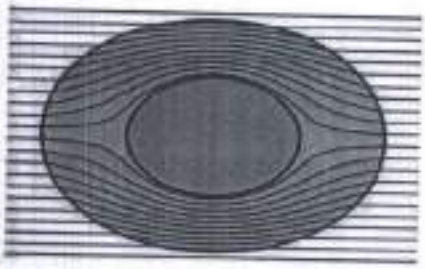

Fig 10 (a): diagram showing bending of light

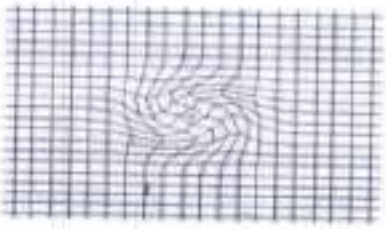

Fig 10 (b): twisting space coordinate

CERTIFICATE

This is to Certify that Project Report entitled

" Astable Multivibrator "

Has been duly completed by following student in satisfactory manner under my guidance asa partial fulfillment for practical in B.sc . Final year (Physics)
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Multivibrator

Definition: An electronic device that produces a non-sinusoidal waveform as its output is known as a **Multivibrator**. The generated non-sinusoidal waveforms are basically a square wave, rectangular wave, a triangular wave, sawtooth wave, or ramp wave etc.

A multivibrator is an electronic circuit used to implement a variety of simple two-state systems such as light emitting diodes, timers and flip-flops. It is characterized by tow amplifying devices (transistors, electron tubes or other devices) cross-coupled by resistors and capacitors.

In its simplest form the multivibrator circuit consists of two cross-coupled by transistors. Using resistor-capacitor networks within the circuit to define the time periods of the unstable states, the various types may be implemented.

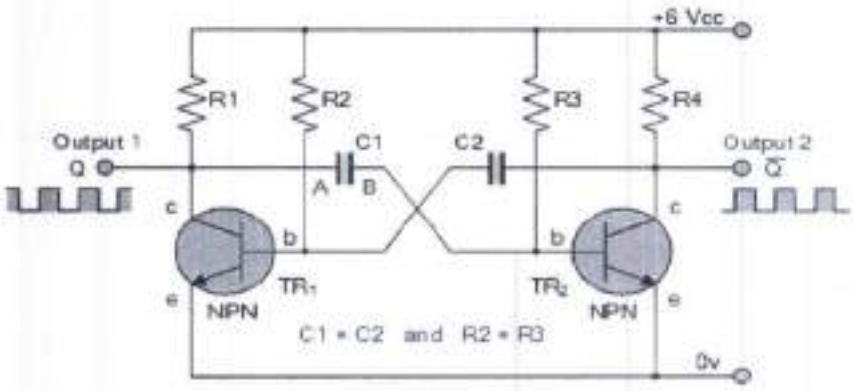
Types of Multivibrator

- Astable Multivibrator
- Monostable Multivibrator
- Bistable Multivibrator

Astable Multivibrator

Astable Multivibrators are free running oscillators which oscillate between two states continually producing two square wave output wavef

Diagrame:



Working :

Astable Multivibrator are the most commonly used type of relaxation oscillator because not only are they simple, reliable and ease of construction they also produce a constant square wave output waveform.

Unlike the Monostable Multivibrator or the Bistable Multivibrator we looked at in the previous tutorials that require an "external" trigger pulse for their operation, the **Astable Multivibrator** has automatic built in triggering which switches it continuously between its two unstable states both set and reset.

The **Astable Multivibrator** is another type of cross-coupled transistor switching circuit that has **NO** stable output states as it changes from one state to the other all the time. The astable circuit consists of two switching transistors, a cross-coupled feedback network, and two time delay capacitors which allows oscillation between the two states with no external triggering to produce the change in state.

In electronic circuits, astable multivibrators are also known as **Free-running Multivibrator** as they do not require any additional inputs or

external assistance to oscillate. Astable oscillators produce a continuous square wave from its output or outputs, (two outputs no inputs) which can then be used to flash lights or produce a sound in a loudspeaker.

Assume a 6 volt supply and that transistor, TR_1 has just switched "OFF" (cut-off) and its collector voltage is rising towards Vcc, meanwhile transistor TR_2 has just turned "ON". Plate "A" of capacitor C1 is also rising towards the +6 volts supply rail of Vcc as it is connected to the collector of TR_1 which is now cut-off. Since TR_1 is in cut-off, it conducts no current so there is no volt drop across load resistor R_1.

The other side of capacitor, C1, plate "B", is connected to the base terminal of transistor TR_2 and at 0.6v because transistor TR_2 is conducting (saturation). Therefore, capacitor C1 has a potential difference of +5.4 volts across its plates, (6.0 – 0.6v) from point A to point B.

Since TR_2 is fully-on, capacitor C_2 starts to charge up through resistor R_2 towards Vcc. When the voltage across capacitor C_2 rises to more than 0.6v, it biases transistor TR_1 into conduction and into saturation.

The instant that transistor, TR_1 switches "ON", plate "A" of the capacitor which was originally at Vcc potential, immediately falls to 0.6 volts. This rapid fall of voltage on plate "A" causes an equal and instantaneous fall in voltage on plate "B" therefore plate "B" of C1 is pulled down to -5.4v (a reverse charge) and this negative voltage swing is applied the base of TR_2 turning it hard "OFF". One unstable state.

Transistor TR_2 is driven into cut-off so capacitor C1 now begins to charge in the opposite direction via resistor R3 which is also connected to the +6 volts supply rail, Vcc. Thus the base of transistor TR_2 is now moving upwards in a positive direction towards Vcc with a time constant equal to the C1 x R3 combination.

However, it never reaches the value of Vcc because as soon as it gets to 0.6 volts positive, transistor TR_2 turns fully "ON" into saturation. This action starts the whole process over again but now with capacitor C2 taking the base of transistor TR_1 to -5.4v while charging up via resistor R2 and entering the second unstable state.

Then we can see that the circuit alternates between one unstable state in which transistor TR_1 is "OFF" and transistor TR_2 is "ON", and a second unstable in which TR_1 is "ON" and TR_2 is "OFF" at a rate determined

by the RC values. This process will repeat itself over and over again as long as the supply voltage is present.

The amplitude of the output waveform is approximately the same as the supply voltage, Vcc with the time period of each switching state determined by the time constant of the RC networks connected across the base terminals of the transistors. As the transistors are switching both "ON" and "OFF", the output at either collector will be a square wave with slightly rounded corners because of the current which charges the capacitors. This could be corrected by using more components as we will discuss later.

If the two time constants produced by C2 x R2 and C1 x R3 in the base circuits are the same, the mark-to-space ratio (t1/t2) will be equal to one-to-one making the output waveform symmetrical in shape. By varying the capacitors, C1, C2 or the resistors, R2, R3 the mark-to-space ratio and therefore the frequency can be altered.

We saw in the RC Discharging tutorial that the time taken for the voltage across a capacitor to fall to half the supply voltage, 0.5Vcc is equal to 0.69 time constants of the capacitor and resistor combination. Then taking one side of the astable multivibrator, the length of time that

transistor TR_2 is "OFF" will be equal to 0.69T or 0.69 times the time constant of C1 x R3. Likewise, the length of time that transistor TR_1 is "OFF" will be equal to 0.69T or 0.69 times the time constant of C2 x R2 and this is defined as.

Astable Multivibrators Periodic Time

$$\text{Periodic Time, } T = t_1 + t_2$$
$$t_1 = 0.69 C_1 R_3$$
$$t_2 = 0.69 C_2 R_2$$

Where, R is in Ω's and C in Farads.

By altering the time constant of just one RC network the mark-to-space ratio and frequency of the output waveform can be changed but normally by changing both RC time constants together at the same time, the output frequency will be altered keeping the mark-to-space ratios the same at one-to-one.

If the value of the capacitor C1 equals the value of the capacitor, C2, C1 = C2 and also the value of the base resistor R2 equals the value of the base resistor, R3, R2 = R3 then the total length of time of the **Multivibrators** cycle is given below for a symmetrical output waveform.

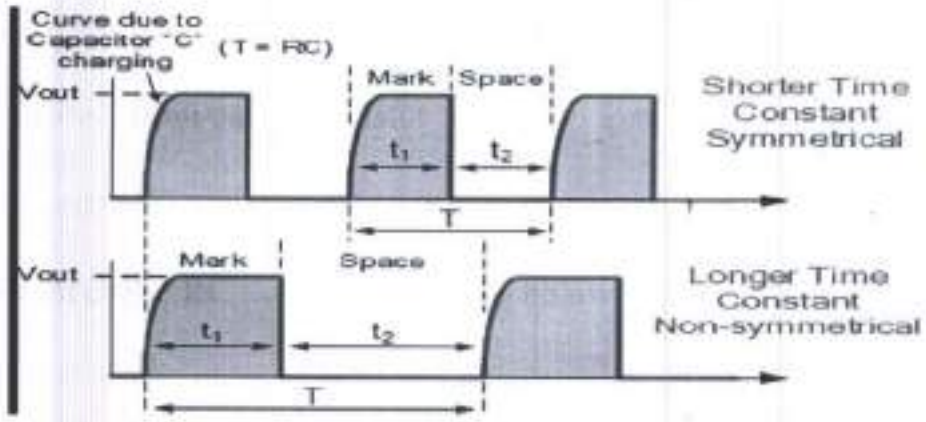
Frequency of Oscillation

$$f = \frac{1}{T} = \frac{1}{1.38RC}$$

Where, R is in Ω's, C is in Farads, T is in seconds and f is in Hertz.

and this is known as the "Pulse Repetition Frequency". So **Astable Multivibrators** can produce TWO very short square wave output waveforms from each transistor or a much longer rectangular shaped output either symmetrical or non-symmetrical depending upon the time constant of the RC network as shown below.

Astable Multivibrator Waveforms



Result :

In the session 2020-21 physics department group wise project are done for the topic Astable Multivibrator. In this project different types of components are used . Work are done during practical period and project successful done.

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Topic : Project

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