Department of Zoology

Subjects in which the field trips are a part of the curriculum

B.Sc. (P) Life Science Sem IV - Visit to natural history museum for Genetics and Evolutionary Biology
B.Sc. (P) Life Science Sem I – Visit to biodiversity park for Animal Biodiversity
B.Sc. (H) Zoology Sem I- Visit to Biodiversity/Zoological park for Ecology
B.Sc. (H) Zoology Sem V- Visit to Biodiversity/Zoological park for Animal behaviour and Chronobiology
B. Sc.(P) Life Science IV (SEC)- Visit to fisheries for Aquarium and Fish Keeping
B.Sc. (P) Life Science V (SEC)- Visit to IARI for Apiculture
B.Sc. (P) Life Science VI (SEC)- Visit to Sericulture Institute for Sericulture

REPORTS OF FIELD VISITS

शिवाजी कॉलेज
(दिल्ली विश्वविद्यालय)
Shivaji College
(University of Delhi)
NAAC ACCREDITED "A" GRADE COLLEGE

संदर्भ सं0 / Ref. No. Shi/Admn/3189/19

दिनांक/Dated 21/10/2019

TO WHOM IT MAY CONCERN

Shivaji College allows 49 students, 3 teachers staff of Department of zoology for an educational trip to visit Zoological Museum, in Department of Zoology (University of Delhi) Delhi on 21st October 2019.This is purely an educational visit.

Administrative officer

प्रवीण कुमार / Parveen Kumar
प्रशासनिक अधिकारी / Administrative Officer
शिवाजी महाविद्यालय / Shivaji College
(दिल्ली विश्वविद्यालय) / (University of Delhi)
राजा गार्डन, नई दिल्ली-110027
Raja Garden, New Delhi-110027

Date – 21/10/2019

B.SC. LIFE SCIENCE IST YR. – Visit to Zoology Museum (Dept. of Zoology)

S.No.	Roll No.	Student's Name	ENTRY TIME	SIGN	EXIT TIME	SIGN
1	19/23001	SAKSHI SHARMA	1:05		3:10	
4	19/23014	DIVYA SHARMA				
5	19/23015	NITIN				
6	19/23016	NISHA CHOUDHARY	1:00		3:10	
7	19/23017	JUHI ADLAKHA	1:07		3:10	
8	19/23018	NIRAJ				
11	19/23027	UMESH PAL	1:00		3:10	
13	19/23029	DEV RAJ VERMA	1:25		3:10	
15	19/23032	PRIYA GOYAL	1:07		3:10	
17	19/23035	AAKASH GUPTA				
18	19/23036	NEHA				
19	19/23038	VAIBHAV KUMAR				
20	19/23040	R SANKEERTHANA	1:15		3:10	
26	19/23047	ARIHANT RAJAN	1:10		3:10	
27	19/23048	CHANDANI JHA	1:04		3:10	
28	19/23049	RAHUL KAUSHIK	1:00		3:10	
29	19/23050	DIVYANSHI	1:07		3:10	
30	19/23052	VISHAL SINGH	1:03		3:10	
31	19/23054	SHAHIN MALIK				
35	19/23058	AMAN TIWARI				
36	19/23060	MRINALINI BISWAKARMA				
40	19/23064	TUBA WAHID				
41	19/23066	RITU GAUR				
44	19/23069	SACHI SINGH				
45	19/23070	KALASH GUPTA				
46	19/23071	KOMAL AHLAWAT				
48	19/23073	SARTHAK				
50	19/23075	ANSHIKA SINGH	1:05		3:10	
51	19/23076	VANSHIKA CHAUHAN	1:15		3:10	
54	19/23079	AVNI AGARWAL				
55	19/23081	ARUSHI GUPTA				
56	19/23082	TAMANNA				
58	19/23084	ADITI JAIN				
59	19/23085	ADITYA RAJ VERMA				
60	19/23086	PALAK GUPTA				
61	19/23087	HARSHITA PANDEY				
62	19/23088	PRIYANSHU PARCHA				
64	19/23090	SACHIN CHAUHAN				
65	19/23092	AJIT GAUTAM				
67	19/23095	TULIKA RAJPUT (EWS)				
68	19/23096	PRASOON VASISTHA				
69	19/23097	ABHISHEK KUMAR				
71	19/23100	PRIYANKA				
72	19/23101	NITIN JANGRA				
73	19/23102	CHESTA GUPTA				
74	19/23103	ISHIKA BHATIA				
75	19/23104	SHREYA KRISHNARTH				

B.SC. LIFE SCIENCE IST YR. Visit to Zoology Museum (Dept. of Zoology)

S.No.	Roll No.	Student's Name	ENTRY TIME	SIGN	EXIT TIME	SIGN
78	19/23107	ABHILASHA				
79	19/23108	SHUBHAM KUMAR				
80	19/23109	SAUMYA VERMA				
81	19/23110	SIDDHARTH SHARMA				
82	19/23111	MANSI DUBEY (ECA)				
83	19/23112	SREELAKSHMI S (ECA)				
84	19/23113	SAKSHI SHARMA(EWS)				
85	19/23114	VAISHALI KHANDELWAL				
86	19/23116	NEHA BHARDWAJ				
87	19/23117	JAGANNATH SAHOO				
88	19/23119	ROHIT KUMAR				
89	19/23121	PADMA DORJEY				
90	19/23122	MUSKAAN DIMRI				
91	19/23123	ISHA				
92	19/23125	KANIKA JAIN				
93	19/23126	ISHA SHARMA				
94	19/23127	KUNAL				
95	19/23128	KHYATI KHATRI				
96	19/23129	MEGHA SOVANI				
97	19/23130	GURDEEP SINGH				
98	19/23131	TANYA KUMARI				
99	19/23132	FARIHA JAAN				
100	19/23134	TANU				
101	19/23135	DEEPIKA PANCHPAL				
102	19/23137	RISHIKA AGGARWAL				
103	19/23138	CINTIA SHIMRAH				
104	19/23139	NEHA PAL				
105	19/23140	NIKHIL SINGH				
106	19/23142	KANIKA RAWAT (CW)				
107	19/23144	ANURAG MISHRA				
108	19/23146	ISHITA JAIN (EWS)				
109	19/23148	KAMAL SINGH				
110	19/23149	PRAHALAD KUMAR (CW)				
111	19/23150	AKSHITA SHARMA				
112	19/23151	FAIZA KHAN (EWS)				
113	19/23152	PIYUSH				
114	19/23153	SHAIKH FARINAZ (EWS)				
115	19/23154	MOHD SHARIQ				
116	19/23155	SWETA				
117	19/23157	VERYPEACE LONGLENG				
118	19/23158	ISHU				
119	19/23159	ABDUL MIQDAM				

21/10/19 21/10/19 Nidhi 21/10/19

11-09-2019

To
The Principal
Shivaji College
Raja Garden
New Delhi 110027

subject: Permission to take students of B Sc (H) Zoology Sem I & B Sc (P) Life Sciences Sem I to the Zoo for educational tour

Respected ma'am,

This is to inform you that students of B Sc (H) Zoology Sem I and B Sc (P) Life Sciences Sem I are expected to have an educational visit to a Biodiversity Park as a part of their curriculum under the papers Animal Behaviour & Animal Diversity respectively. We have planned a visit to Delhi Zoo on 16th September, 2019 for the same. Consent from parents of all students will be taken from the visit and the following teachers will accompany them – Dr Aeshna Nigam, Dr Ankita Jain, Dr Tarun K Vats, Dr Neetu Singh & Dr Nidhi Garg. Kindly allow us for the same.

Thanking you,

Yours sincerely,

Aeshna Nigam
Ankita Jain
Dr Neetu Singh 11/9/2019
Nidhi

11-9-2019
[DR. SUNITA GUPTA]
TIC
Dept of Zoology

Anita Kapur
Vice-Principal
Shivaji College

MINUTES OF THE MEETING

A meeting was held in Department of Zoology on 12th September, at 1pm to decide the schedule of the upcoming educational tour to Delhi Zoological park on Monday, 16th September, 2019. Students of B.Sc(H) Zoology Semester V & B.Sc (P) Life Science Sem I will be taken for this educational trip along with teachers of their respective subjects. Dr Archna Nigam, Dr Anduta Brca, Dr Tarun K Vats, Dr Neetu Singh & Dr Nidhi Garg. The tour is scheduled from 9am – 1pm and the students will be responsible for their own commuting. They have been asked to submit their permission letters from their parents / local guardian. A copy of the syllabus is attached.

The following members were present:

Dr. Archna Nigam Archna Nigam

Dr Anduta Brca Anduta Brca

Dr Tarun Kr Vats

Dr Nidhi Garg Nidhi

Dr Neetu Singh 12/09/19

[DR SUNITA GUPTA]
TIC
Dept of Zoology

Zoology (H) IIth sem Date - 16-09-2019

	Name	Roll no	Attendance in	out
1	Meenakshi	17/22015	Meenakshi	✓
2	Deepali	17/22005	D Rai	✓
3	Himanshi	17/22014	Himanshi	✓
4	Nishtha	17/22032	Nishtha	✓
5	Rigzin	17/22037	R Angmo	✓
6	Ayushi	17/22001	Ayushi Jain	✓
7	Nisha	17/22035	Nisha	✓
8	Vaishnavi	17/22034	Vaishnavi	✓
9	Hidam	17/22023	H Roshan Singh	✓
10	Ajay	17/22007	Ajay	✓
11	Rakesh	17/22003	Rakesh	✓
12	Mohit	17/22031	Mohit	✓
13	Sachin	17/22020	Sachin	✓
14	Mayank	17/22006	Mayank	✓
15	Anuki	17/22022	Anuki	✓
16	Manya	17/22041	Manya	✓
17	Gautami	17/22040	gautami	✓
18	Priyanshi	17/22012	Priyanshi	✓
19	Prachi	17/22030	Prachi	✓
20	Sheetal	17/22008	Sheetal	✓
21	Akansha		Akansha	✓
22	Lucky	17/22013	Lucky	✓
23	Aprooja	17/22017	Aprooja	✓
24	Divesh	17/22024	Divesh	✓

Archana Nigam 16/9/2019

16th September, 2019

LL.B Sem I

14	Divya Sharma		
16	Nisha Chaudhary		
17	Jyoti		
18	Niraj		
27	Umesh Pal		
28	Dev Raj Verma		
32	Priya Goyal		
38	Vaibhav Kumar		
40	R. Sankeerthana		
47	Arishant Rajan		
48	Chandni Jha		
49	Rahul Kaushik		
52	Vishal Singh		
54	Shahin Malik		
58	Aman Tiwari		
63	Mrinalini		
69	Sahil Singh		
70	Kailash Gupta		
75	Anshika		
76	Vanshika		
79	Avni		
85	Aditya Raj Verma		
87	Harshita Pandey		
88	Priyanshu		

102	Aresta Gupta	Chesta Gupta	Chesta Gupta
107	Abhilasha	Abhilasha	Abhilasha.
116	Neha Bhardwaj	Neha Bhardwaj	Neha Bhardwaj
117	Jagannath Sahoo	Ash°	Ash°
129	Megha	Megha	Megha
122	Muskan Dimri	Muskan.	Muskan.
126	Isha Sharma	Isharma.	Isharma
128	Khyati	Khyati	Khyati
131	Tanya Kumari	Tanya.	Tanya.
130	Gurdeep Singh	Gurdeep	Gurdeep
132	Farha Jaan	Farha Jaan	Farha Jaan
134	Tanu	Tanu	Tanu
139	Neha Pal	Neha Pal	Neha Pal.
140	Nikki	Nikki.	Nikki.
142	Kanika Rawat	Kanika	Kanika
148	Kanak Singh	Kanak Akshita Sharma	Kanak Akshita Sharma
150	Akshita	Akshita	Akshita
152	Priyush	Priyush	Priyush
155	Sweta	Sweta	Sweta
158	Ishu	Ishu	Ishu
127	Kunal	Kunal	Kunal
97	Abhishek	Abhishek	Abhishek
103	Ishika	Ishika	Ishika
90	Sachin	Sachin.	Sachin
104	Shreya	Shreya	Shreya
101	Nitin	Nitin.	Nitin
26	Neha	Neha	Neha
111	Manni	Manni	Manni

16/09/2019

16/09/19.

A Report on visit to TERI

(The Energy resources Institute)

(15, April, 2015)

Submitted By

Sarshi Dhall

12/44013.

BSc. Zoology (H)

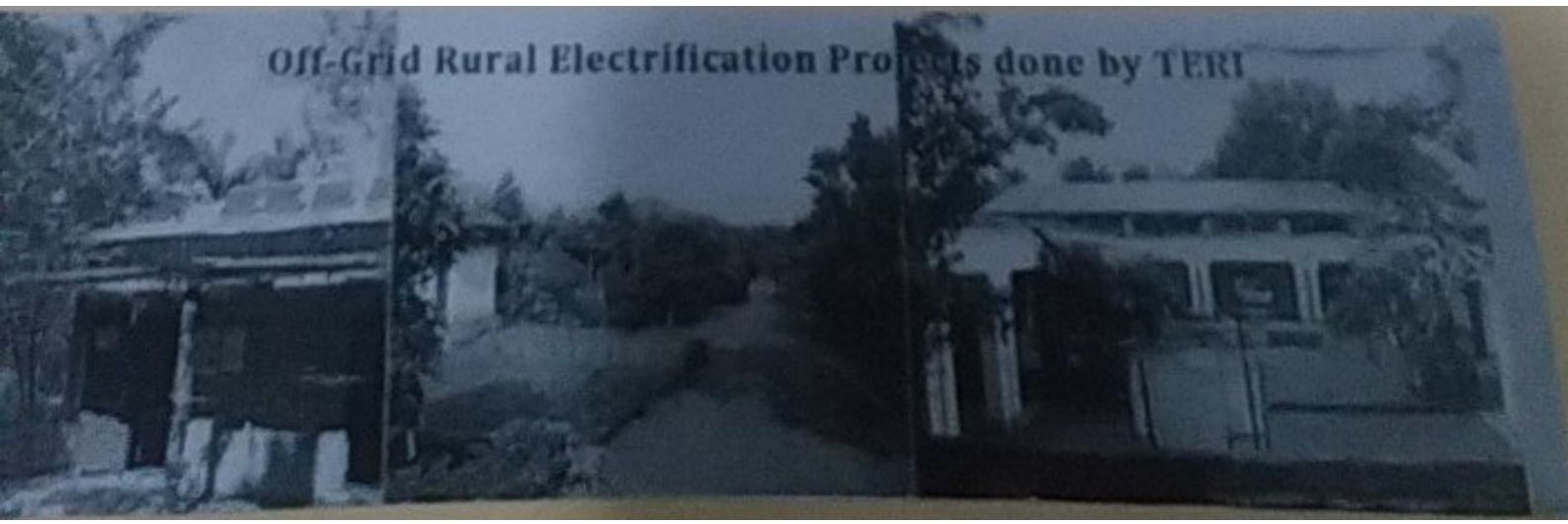
VI Semester.

CERTIFICATE

This is certified that the report on A VISIT TO TERI is a certified work of B.Sc. (Hons) zoology III Semester student Sakshi Dhail under my guidance and directions

Dr. Anjali Saxena

Dr. Jeetendra


Off-Grid Rural Electrification Projects done by TERI

Report on a trip to anthropology department, DU

MANISHA GUPTA
B.Sc. LIFE SCIENCE
IVth Sem.
ROLL NO. -15/62014

Date Topic

Acknowledgement

I take this opportunity to thank the principal of Shivaji College, Delhi university, Dr. Shashi Nijhawan for allowing us to go for an educational trip to the museum of Anthropology Department, Delhi University.

I wan am highly indebted to Dr. Aeshna Nigam, Dr. Ankita Dua and Dr. T.K. Chaudhary for their guidance and constant supervision as well as for providing necessary information regarding the report and during the trip.

To

The Principal
Shivaji College
University of Delhi
Delhi 110027

ub; Request to visit Government Fisheries Farm, Seelampur on 08/03/2

Respected Madam,

This is in regards to seek your permission to visi
Government Fisheries Farm, Seelampur, Delhi on 8th march 2019
on account of academic practical syllabus of B.Sc (Life Science
4th Semester. The visit is a part of B.Sc (CBCS) practical
Skill Enhancement course - Aquarium fish keeping. to understand
and gain knowledge of fish keeping and maintenance.
Kindly grant us the permission to visit the same.

Thank you

Date: 06/03/2019.

Yours Truly

Dr. Tanvir Kumar
Department of Zoology
Shivaji College
D.U

Forwarded!
M Saxena
06th/March/2019.

6/3/19.

Principal
Shivaji College
(University of Delhi)
New Delhi-110027

12. Educational Visit as per syllabus

To

The Principal
Shivaji College
Raja Garden
University of Delhi
Delhi – 110027

Subject: Permission for student visit to Indian Agriculture Research Institute, Pusa, Delhi

Respected mam,
With due regards, I want to state that an academic visit of B.Sc Life Sciences V semester students is organized on Friday (27/10/ 2017) to Indian Agriculture Research Institute (IARI), Pusa, Delhi. The visit is a part of practical syllabus for Skill Enhancement Course - Apiculture, requiring students to learn and develop understanding of an apiary / honey processing unit/ Institute. Kindly grant us the permission for the same. The accepted e-mail copy from Head, Entomology Division, IARI, has been attached.

Thank you

Dr. Tarun Kumar Vats
Zoology Department
Shivaji College
University of Delhi

Dr. Anil Kumar.
Zoology Department
Shivaji College.

Signature: Teacher in-Charge.
25/10/17

Attach Parent consent form

Signature 25/10/17

Gmail

Tarun Vats <trnvts@gmail.com>

Permission for student visit to Entomology division

4 messages

Tarun Vats <trnvts@gmail.com> Fri, Oct 13, 2017 at 2:12 PM
To: head_ento@iari.res.in

Respected mam,
I, Tarun Kumar, seeks your permission for visit of students from Shivaji college, University of Delhi, in the entomology division, IARI, to understand and gain practical knowledge of apiary/ honey processing unit. The visit is a part of students academic practical syllabus. We expect a visit in next week (date- 20/ 21 October, 2017).Kindly grant us the permission for the same and please suggest dates if not possible on the expected dates.
Waiting for your response.

Thank you

Dr. Tarun Kumar Vats
Assistant Professor
Shivaji College
University of Delhi

head_ento@iari.res.in <head_ento@iari.res.in> Fri, Oct 13, 2017 at 4:05 PM
To: Tarun Vats <trnvts@gmail.com>

Please try to come after deepawali
chitra
[Quoted text hidden]

Tarun Vats <trnvts@gmail.com> Tue, Oct 24, 2017 at 3:41 PM
To: head_ento@iari.res.in

Respected mam,
This is in regards to earlier mail. Kindly allow a student visit in this week preferably on Friday or Saturday (27/ 28).

Thank you
[Quoted text hidden]

ead_ento@iari.res.in <head_ento@iari.res.in> Tue, Oct 24, 2017 at 4:27 PM
To: Tarun Vats <trnvts@gmail.com>

Dr Tarun
You please come on friday.
with best wishes
chitra

----- Original Message -----
From: Tarun Vats <trnvts@gmail.com>
To: head ento <head_ento@iari.res.in>
Sent: Tue, 24 Oct 2017 15:41:53 +0530 (IST)
Subject: Re: Permission for student visit to Entomology division
[Quoted text hidden]

Visit To IARI

(Entomology Division)

Report By - RACHNA

B.Sc. LifeSci. Sec.A Sem V

Roll No.- 1507158040

10/01/2017

Acknowledgement

I express my sincere respect and gratitude to my teachers, Dr. Tarun Vats and Dr. Anil Kumar. who organized this wonderful visit to IARI. for us.

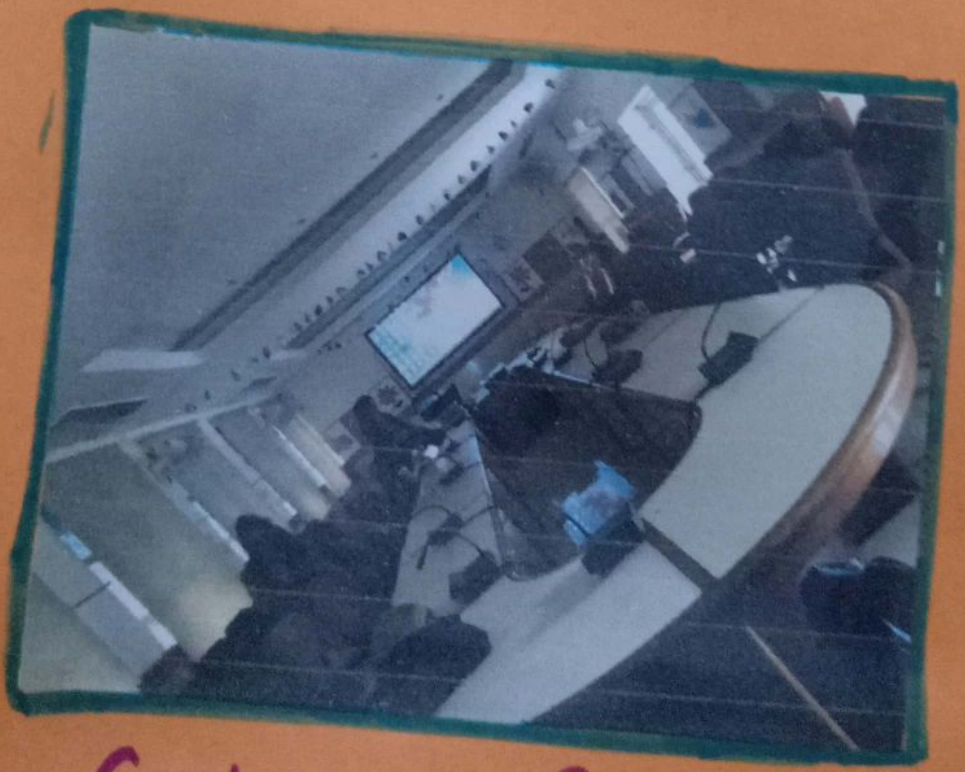
I would also like to thanks our Principal Mam, Dr. Shashi Nijhawan, who gave us permission to go to the institute.

Secondly, I would also thanks to Dr. Chitra Shrivastav who permitted our visit to IARI, as well as to Dr. Shashank for guiding us and for the knowledge which he imparted to us.

The Apiary managment staff is also hereby mentioned for giving us the practical knowledge about the handling and processing in an apiary. I thanks them too.

Most importantly, I would like to thanks to my parents, who allowed me to go to this visit. Without their permission I would never be able to understand such interesting facts and techniques used in apiary. Thanks again to all who helped me.

RACHNA



Conference Room

Topic .....

A Visit to IARI Entomology Division

Indian Agricultural Research Institute (IARI), govt. institute, situated at Hill side road, Pusa, New Delhi, Delhi 110012.

We went there to our accomplishment of practical knowledge for Bee keeping.

As we reached there, we were went directly to conference room for the lecture by Dr. Shashank on Bees.

He started his valuable knowledge with the topic 'Pollination and Honey Bee', in which he told from basic definition to the higher one.

He told that there was 28 Honey bee colonies.

How honeybees contribute to farm lands, crops, pollination all that was covered by him.

Bees economic value of pollination all over world is € 153 billion.

Total insects pollination is € 217 worldwide.

All that he taught us.

After that told that mainly 4 insects orders are pollinating which are—

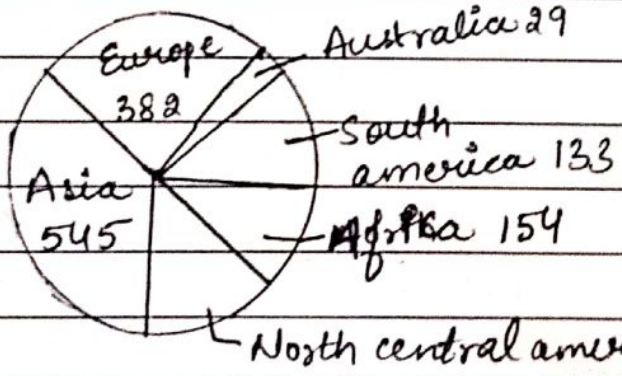
Hymnoptera
Lepidoptera
Diptera

Teacher's Signature .....

Coleoptera.
Then he added that, Only a few states in India, pollination by Honey Bees is done. Not major contribution by bees to pollination is seen, so the main objective of apiaries is not pollination.
With these basic frames he made us understand about pollination in little more detail.

Then he started with Bee pollination. He told that scientific term is Melittophily for bee pollination.
Further added that,
In Last 17 years, there is 70% Decline in diversity of insects.

He told us about some statistical values too, like -
World Honey production by Region (2005). 1000 tonnes



Next to this static data, we were told about the Apiaries in India.
There are 3000-4000 Apiaries but they are very small. So most of production is done by wild varieties such as Apis dorsata

Teacher's Signature .....

Topic .....

Date ...../...../.....

Then he put light in very brief on insect pollination by moths, butterflies, flies, Beetles. such as Myophily / sapromyophily (flies) and cantharophily (beetles).
Oil palm is very species specific and came from Malasiya to India, here pollination by beetles is occurs.

Then he added to our knowledge about five important Bee species-

→ Apis dorsata - largest in size, largest living honey Bee, stores Honey vertically.

→ Apis florea

→ Apis cerena indica → Native to India.
Apis koschevnikovi → Both are same subgenus.

→ Apis mellifera - In northern India, May-Aug. Indo-gagn gangatic belts are very harsh. For forems it is hard to feed their colonies. So, they pack their colonies and migrate them to Himachal pardesh, Uttar pardesh for flora via trucks. This mechanism is adapted by mellifera species only.

→ Dammer bee - Stingless Bee.
~~Melipona~~ Melipona & Trigona are two stingless genus.
Melipona is not true bee.
They both occur in abundance in India.

Note- Good Apiary should have 400-500 colonies.

Teacher's Signature .....

After telling the species of Honeybee, He told us about the mechanism of honey bee life history transitions.
The tasks after emergance days were very interesting to know that how cell cleaning, capping brood, tending brood, attending brood, queen, recieving nectar, cleaning deberis, packing pollen, comb building etc etc done by bees, at what day after emergance.

Altogether, at the completion of lecture we were very much knowledge filled about the bees.

Bee Movie

Next to the interesting lecture, we had a movie — Bee-Movie → animated movie.
Bee movie is a 2007 American computer animated and produced by 'DreamWorks Animation', distributed by 'Paramount Pictures', Directed by 'Simon J. Smith' and 'Steve Hickner'
The movie was a comedy film, which described the importance, functioning in hive, and work distribution among bees.
The story followed 'Barry B. Benson' (Honey bee) who sues human race for exploiting bees after learning from his florist friend Vanessa (Zellweger) that humans sell and consume honey.

Plot of the movie-

A Honey bee named Barry B. Benson has recently graduated from college and is about to enter the hive's Honex Industries honey-making workforce alongside his best friend Adam Flayman.

Barry was initially excited to join the workforce but his courageous, non-conformist attitude emerges upon discovering that his choice will never change once picked. Later, the 2 bees ran into a group of pollen jocks, bees who collect pollen from flowers outside the hive.

While on his first pollen gathering expedition in New York City, Barry got lost in rain & ended up on the balcony of a human florist named Vanessa.

Upon noticed Barry, Vanessa's Boyfriend Ken attempted to squash him, but she gently catched and released Barry outside window, saving his life.

Later Barry returned to express his gratitude to her, breaking the scared rule that bees are not supposed to communicate with humans.

Barry & Vanessa developed a close bond, bordering on attraction, & spent time together frequently. In between all this, Barry was terrified to discover that the humans had been stealing & eating the Bee's Honey for centuries. He journied to Honey farms, which supplied the grocery store with its Honey. Furious at the poor treatment of the bees in hive, including the use of Bee Smokers to Subdue the colony, Barry decided to sue human race to

Teacher's Signature .....

an end in to exploitation of bees.
Barry's Mission attracted wide attention from bees and humans alike & 1000s of people showed up to watch the Trial. Although Barry was against tough defense attorney Layton T. Montgomery, Barry won the trial by exposing the jury to the cruel treatment bees were subjected to smoker, and humans were banned from stealing honey from bees ever again.
Having lost the trial, Montgomery cryptically warned Barry that a negative shift in the ~~balance in nature~~ (is immense) balance of nature is imminent. As it resulted, the sudden, massive stockpile of Honey had put every bee out of job, including the vitally important Pollen Jocks. As a result, without anything to pollinate them, the world's flowers slowly began to died out. The only flowers left with healthy pollen were those in a flower parade called 'The tournament of Roses' in California.
Armed with the pollen of the last flowers with the help of ~~Vanessa~~ Vanessa, Barry & the Pollen Jocks managed to reverse the damage & saved the world's flowers restarting bees' Honey production.
Humans & bees were seen working together & certain brands of Honey then 'Bee approved'. Barry became the member of pollen Jocks. Barry was also seen running a law firm inside Vanessa's flower shop titled 'Insects at law'. And there the movie ended.

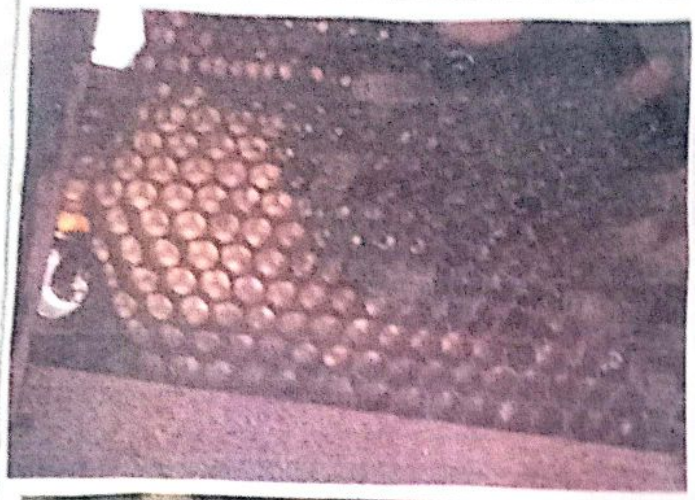
Teacher's Signature .....

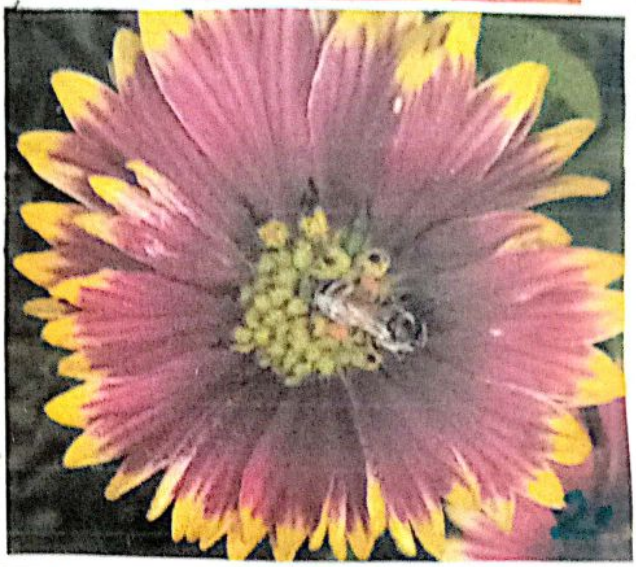
THE APIARY -

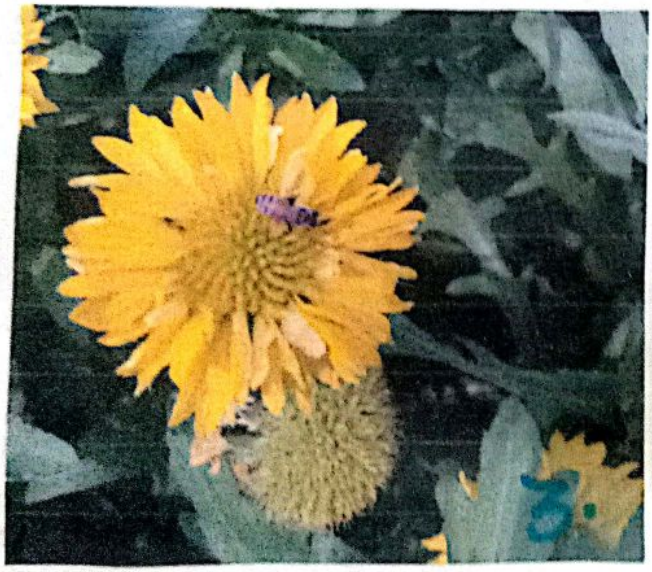
Newton's Hive in Apiary

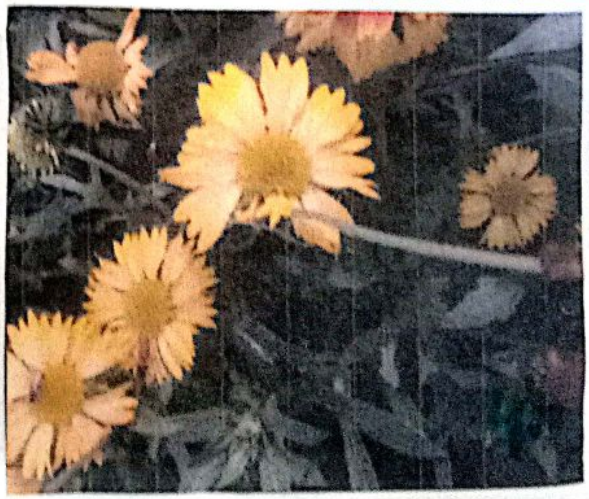
→ Frame

- Queen Bee in the frame.









The flora of Apiary - 1, 2, 3, 4.

Gaillaredia spp. - Provide nector and pollens to Bees.

Bee keeping Equipments

After watching the movie, we moved towards farmland where apiary was situated. There was 28 colonies. The guide was there to made us understand about the life inside the the hive.

We had seen, the queen cells which are small in size. Workers cells are comparatively larger. we saw the honey in combs, yellowish illumination was seen due to sunlight. We had seen wax also. Only workers were there in the colony no, drones were there.

We had seen the capped larval cells, in which eggs there.

Then, the guide there shown us the queen. The abdomen was largest among all the bees. Queen was slender and long, ~~wks~~ and ~~seen~~ characterized easily.

We had seen the bee flora. We seen the major production of Grillardia pulchella and Grillaredia grandiflora there, which attracts honey bee the most. Honey bees were visiting to these flowers. Also, farming of maize (Zea mays) and cotton were there, which also attracts the bees.

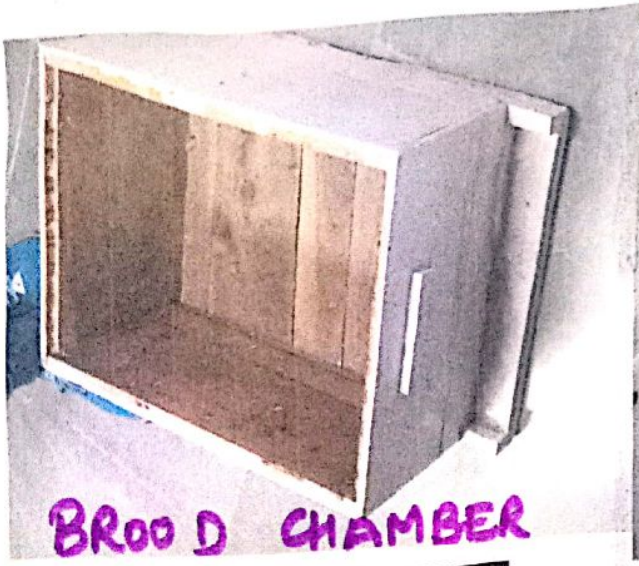
Then we went to the equipment room of Apiary. There we saw all the equipment used in handling of honey bees.

We saw the following equipments-

- Brood chamber - A square wooden box which is used to kept the colonies.
- Queen excluder - A sheet which separates the queen to move to the down side cells, and hence protect the queen.
- Super chamber - kept over the brood chamber for collection of honey.
- Propolis sheet - A blue coloured plastic (polymer) sheet. Basically used in rainy season to prevent the entry of moths, flies and other bee enemies in to the hive. It is sealed with amber on super chamber.
- Queen rearing kit - In case the queen in colony is died, so new queen is required by the colony for their survival. To ~~synthesize~~ rear queen egg a special kit is designed in which hole of size of queen cell is there. It is kept in to the hive in which queen is present. It is kept for 3 days in the colony where queen is present. Egg of queen is reared. Then the cells are capped by another white coloured cap so that rearing of new queen is done. Within 21 days new queen is reared. But, to prevent failure of unhealthy queen, approx 10-12 queens are reared at once. It is the additional tool used in case of queen's death.
- Queen cage - After queen is reared outside the hive, it is needed to kept in the queen less hive. But, the new queen is not directly accepted by the colony. So, this cage (red coloured) is used for about 3-4 days.

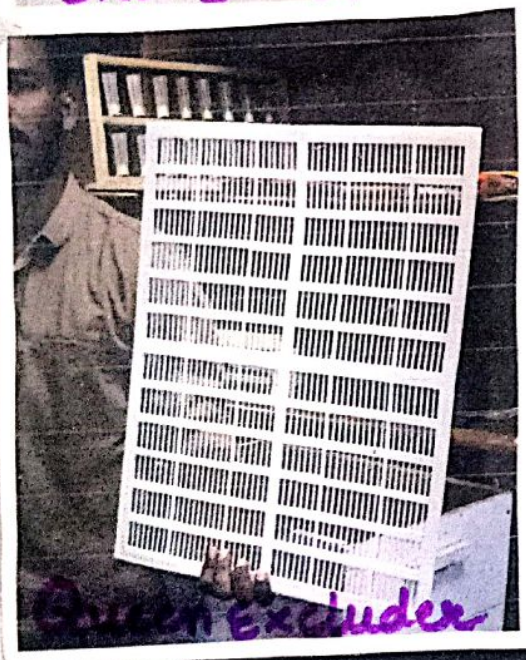
Teacher's Signature .....

Processing Unit -

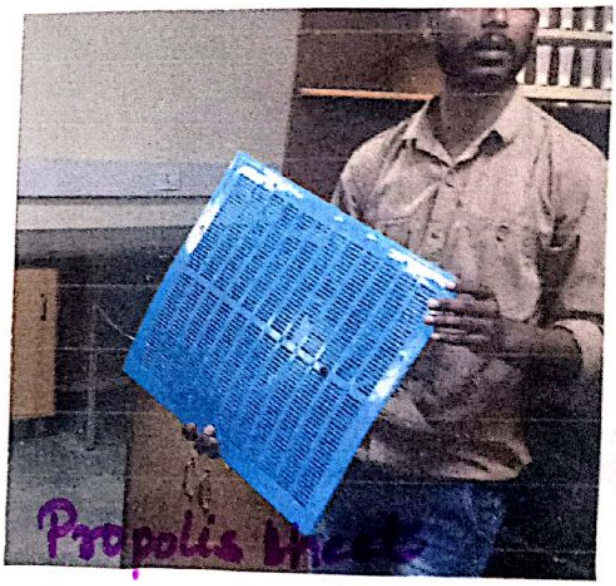


BROOD CHAMBER

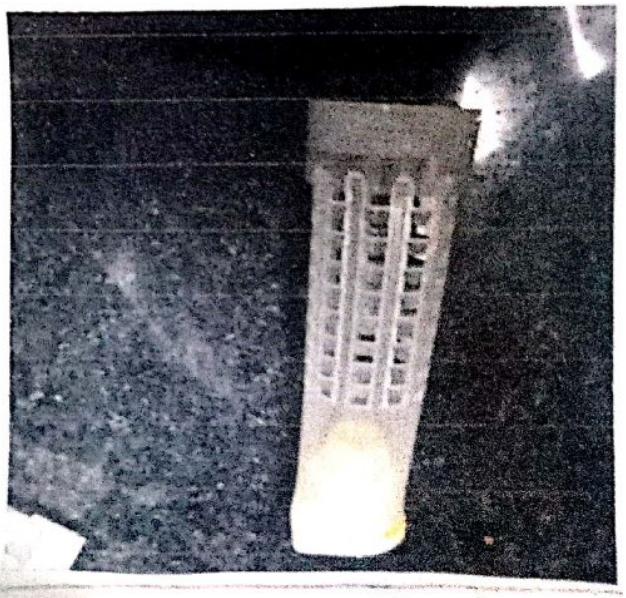
LANGSTROTH HIVE

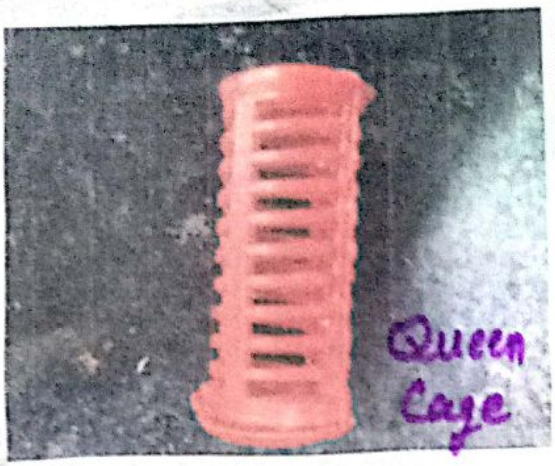


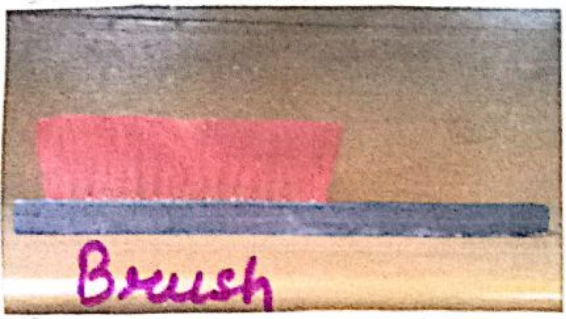
Queen Excluder

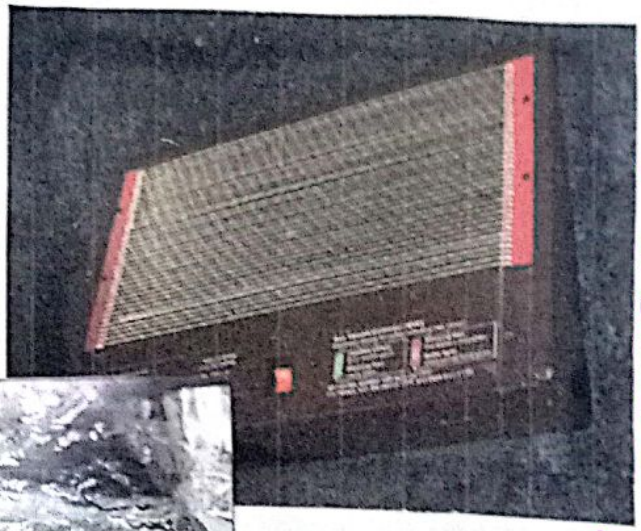


Propolis trap









SWARM CATCHING BAG

FRAME HOLDER

HONEY COLLECTO

In this time the workers of queen less ~~time~~ colony accept the new queen.

Note- Queen rearing kit and queen cage are used when the ~~workers~~ there is no larva in the colony. So rearing of queen is not possible by colony itself. Hence, queen is reared outside.

- Knife - It is used to uncap the cells. When cells are filled they are thermatically sealed by capping with wax. Before placing such combs in honey extractor, needed to be uncapped. Hence, knife is used.

- Brush - Used to brush off the bees before taking ~~the~~ it to extractor (Honey).

- Venom collector - It is a wooden device, with metallic covering of wires over it (approx 70% covered). It is kept at the sideways opening of brood chamber in the morning (before sunlight reached to hive). Bees find it strange and sit over metallic wiring. Then very low current is passed to wiring, hence in defense bees sting over to the wiring and the venome is collected.

- Smoker - It consists of a can provided with a snout for directing smoke from the smouldering material inside it with the help of operated bellows.

- Swarm catching bag - It is wore by the person who is going to catch the swarm.

- Honey Extractor - It is a machine with which honey is separated in honey comb. The honey comb is whirled in a cage enclosed in an outside container and honey is thrown out under the centrifugal force and is free from any other material.

Bee Products

→ Wax - It was stored in a yellow circular disc shaped plate. It was yellow coloured and hard and very heavy.

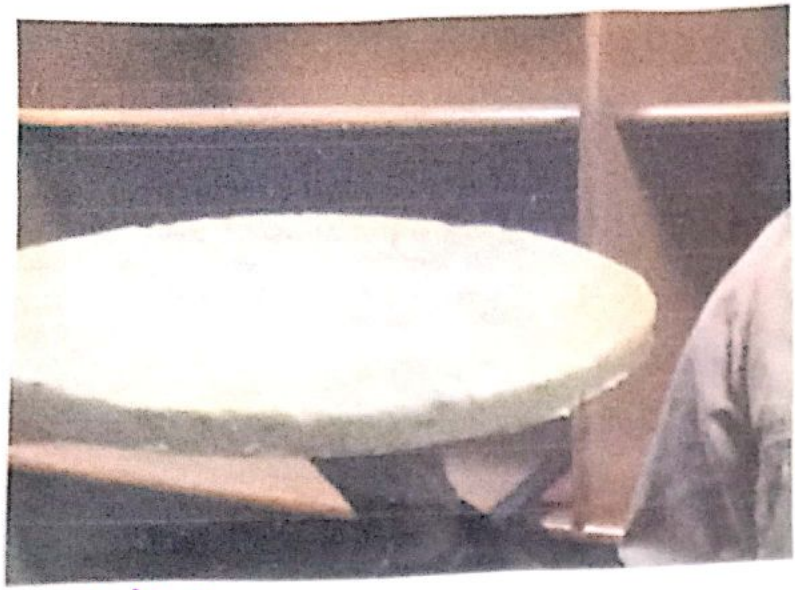
→ Honey - It was ~~stored~~ present in the comb, brownish coloured fluid.

→ Pollen - Yellowish powder like pollens are stored in a glass bottle.

→ Propolis - Blackish smaller cylinderical object like form observed in which it was stored.

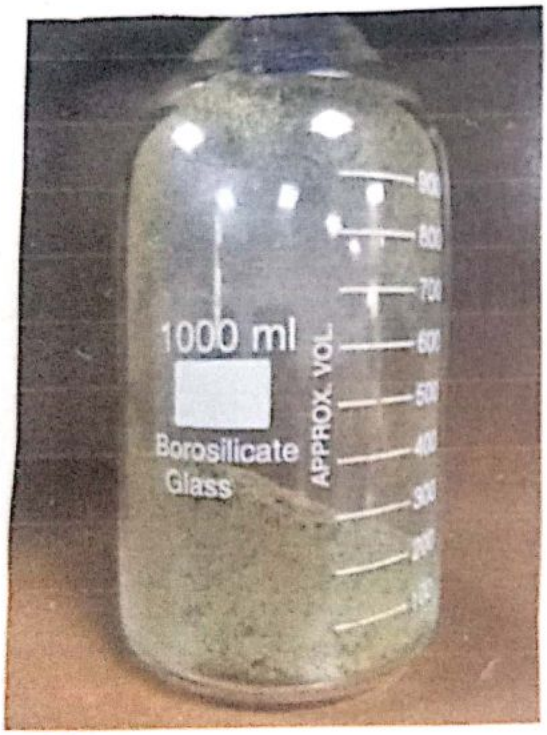
All this equipments and products were deeply elaborated by staff present there, thus I am able to listed above them all.

The visit was very very much helpful to my or enhance my practical knowledge.



Wax

Wax



Pollen

Propolis

BEE PRODUCTS

21-03-2018

To

The Principal
Shivaji College
Raja Garden
University of Delhi
Delhi – 110027

Subject: Permission for student visit to Department of Geology, University of Delhi

Respected ma'am,

With due regards, we the following undersigned teachers of Zoology department hereby state that as per the prescribed syllabi of B. Sc. (Life Science) IV semester for Paper name- Genetics and Evolutionary Biology. We have to organize an academic visit to Natural History Museum therefore we are planning to take our students to the Department of Geology, University of Delhi on Tuesday the 27th of March 2018. This visit will help the students to develop a better understanding on various evolutionary aspects. In this regard we are seeking your permission.

Thank you

Anuita Bua Anuitabua
Rashmi Singh Rashmi Singh
Tarun Kumar
Jeshua Nigam Jeshua Nigam.
Anil Kr. Meena. Anil

Department of Zoology
Shivaji College
University of Delhi

Forwarded
Sunita Kaul
Teacher - in Charge
Dept. of Zoology

PROJECT REPORT

VISIT TO

DEPARTMENT OF

GEOLOGY

CERTIFICATE

Department of Life Science
Shivaji College, University of Delhi

This is to certify that Ashwani Kumar Mishra. student of BSc Life Sciences, has successfully completed this report on Visit to Department of Geology, Delhi University under the guidance of all the teachers of Department of Zoology.

Examiner Signature

Teacher's Signature

ACKNOWLEDGEMENT

I have taken efforts in this project. However it would not have been possible without the kind support and help of many individuals and organisations. I would like to extend my sincere thanks to all of them.

I am highly indebted to (Dr. Ankita Dua and Dr. Rashmi Singh) our teacher for their guidance and constant supervision as well as providing necessary information regarding the project and also their support in completing the project.

I would like to express my gratitude towards members of my College and all the teaching faculty of Department of Zoology for their kind co-operation and encouragement which help me in completion of this project.

ABSTRACT

Geology is the study of the Earth, the materials of which it is made, the structure of those materials, and the processes acting upon them.
It includes the study of organisms that have inhabited our planet. An important part of geology is the study of how Earth's materials, structures, processes and organisms have changed over time.
Earth Science is the study of the Earth and its neighbours in space. It is an exciting science with many interesting and practical applications. **Geology**, is the primary earth science. Geologists search for fuels and minerals, study natural hazards, work to protect Earth's environment.

Palaeontology is the scientific study of life that existed prior to, and sometimes including, the start of the **Holocene** Epoch. It includes the study of fossils to determine organisms evolution and interactions with each other and their environment.
Palaeontological observations have been documented as far back as the 5th century BC.

Great Oxygenation Event
(Origin of life)

Origin of life showing Nucleic Acid & Protein formation

Topic : .....

INTRODUCTION

- The Department of Geology in Delhi University was introduced in 1966 and was inaugurated by Dr. C.D. Deshmukh, the Vice-Chancellor of Delhi University, Dr. A.N. Jhingaran, after retreat as Director General, Geological Survey of India, was afforded the charge of founding this Department, the department has acquired distinction in teaching and research as well as for dissemination of geological knowledge both at the national and international level.
- The department has been granted with Ford foundation award for equipments, Special Assistance Programme (DSA) of the UGC, COSIST, DST-FIST and presently Centre for Advance Studies (CAS) for UGC.

GREAT Oxygenation Event

- The Great Oxygenation Event, the beginning of which is commonly K/a in scientific media as the Great Oxidation Event (GOE, also called Oxygen Catastrophe, Oxygen Crisis, Oxygen Holocaust, Oxygen Revolution, or Great Oxidation) was the biologically induced appearance of dioxygen O_2 in Earth's atmosphere.
- Geological, isotopic and chemical evidence suggest that this major environmental change happened around 2.45 bya (2.45 Ga), during the Siderian Period, at beginning of Proterozoic Eon.
- Oceanic Cyanobacteria, which evolved into coordinated macroscopic forms more than 2.3 bya (approx. 200 mya before the GOE), are believed to have become the first microbes to produce oxygen by photosynthesis.
- Before the GOE, any free oxygen they produced was chemically

captured by dissolved iron or organic matter. The GOE started when these oxygen sinks became saturated, at which point oxygen produced by the cyanobacteria was free to escape into the atmosphere.

- Free oxygen is toxic to **obligate anaerobic organisms**, and the rising concentrations may have destroyed most such organisms at the time.
- Cyanobacteria were therefore responsible for one of the most significant **mass extinctions** in Earth's History.

HISTORY OF EARTH

- The history of Earth concerns the development of planet Earth from its formation to the present day.
- Earth formed around 4.54 billion years ago, approximately one-third the age of the universe, by accretion from the solar nebula.
- Volcanic outgassing probably created the primordial atmosphere and then the ocean, but the early atmosphere contained almost no oxygen.
- Much of the Earth was molten because of frequent collisions with other bodies which led to extreme volcanism. While Earth was in its earliest stage (Early Earth), a giant impact collision with a planet-sized body named **Theia** is thought to have formed the Moon.
- Over time, the Earth cooled, causing the formation of a solid crust and allowing liquid water on the surface.
- The **Hadean** eon represents the time before a reliable (fossil) record of life; it began with the formation of the planet and ended 4.0 billion years. The following Archean and Proterozoic eons produced the beginning of life.
- These are microbial mat fossils such as **stromatolites** found in 3.48 billion year old sandstone discovered in Western Australia.

Evolution

Origin of Life?

Where does life come from? Life must come from life

But what about the beginning?

Could Life have developed on Earth under abiotic conditions?

- Earth is approximately 4.5 billion yrs old
- Hot, barren, rocky, and bombarded with meteorites
- Atmosphere composed of nitrogen, carbon monoxide, hydrogen, and water vapor but NO OXYGEN
- Hot lava, ultraviolet light, poisonous gases, lightning

Volcanic Eruption

Topic : .....

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- Other early physical evidence of a biogenic substance is graphite in 3.7 billion year old metasedimentary rocks discovered in Southwestern **Greenland** as well as "remains of biotic life found in 4.1 bya rocks in **Western Australia**.

- The Earth's crust has constantly changed since its formation, as has life has since its first appearance. Species continues to evolve, taking on new forms, splitting into daughter species, or going extinct in the face of ever-changing physical envisonments.
The process of plate tectonics continues to shape the Earth's continents

PLATE TECTONICS

- Plate tectonics is a scientific theory describing the large-scale motion of seven large plates and the movements of a larger number of smaller plates of the Earth's lithosphere. Since tectonic processes began on Earth between 3 and 3.5 billion years ago.

- The model builds on the concept of continental drift, an idea developed during the first decades of the 20th century

- Tectonics plates are composed of **Oceanic lithosphere** and continental lithosphere, each topped by its own kind of crust.

- Along convergent boundaries, Subduction, or one plate moving under another, carries the lower one down into the **mantle**; the material lost is roughly balanced by the formation of new (oceanic) crust along divergent margins by seafloor spreading.

- Tectonic plates are able to move because the Earth's lithosphere has greater mechanical strength than the underlying **asthenosphere**.

- The Key principle of plate tectonics is that the lithosphere exists as seperate and distinct tectonics plates, which side on the fluid-like (visco-elastic solid) asthenosphere.

- **Plate Boundary** - The location where two plates meet is called a **plate boundary.**
- Plate boundaries are commonly associated with geological events such as earthquakes and the creation of topographic features such as mountains, volcanoes, mid-ocean ridges, and oceanic trenches.

Types of Plate Boundaries

1. Transform boundaries (Conservative)

- Occurs where two lithospheric plates slide, or perhaps more accurately, grind past each other along **transform faults**, where plates are neither created nor destroyed.
- **San Andreas Fault** in California is an example of a transform boundary exhibiting dextral motion.

2. Divergent boundaries (Constructive)

- Occurs where the two plates slides apart from each other. At zones of ocean-to-ocean rifting, divergent boundaries form by seafloor spreading, allowing for the formation of new ocean basin.
- At zones of continents-to continent rifting, divergent boundaries may cause new ocean basin to form as the continented splits, spreads, the central rift collapses, and oceans fills the basin.
- Active Zones of Mid-ocean ridges and continent-to-continent are examples of divergent boundaries.

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3. Convergent Boundaries (Destructive)

- Occurs where two plates slide toward each other to form either a subduction zone (one plate moving underneath the other) or a continental collision.
- At zones of ocean-to-continent subduction (e.g. the Andes mountain range in South America, and the Cascade Mountains in Western US), the dense oceanic lithosphere plunges beneath the less dense continent.

4. Plate Boundary

- Occurs where the effects of the interactions are unclear, and the boundaries, usually occusing along a broad belt, are not well defined and may show various types of movements.

Tectonic Forces

- Dissipation of heat from the mantle is acknowledged to be the original source of the energy required to drive plate tectonics through convection or large scale upwelling and doming.
- A powerful source of plate motion is generated due to the excess density of the oceanic lithosphere sinking in subduction zones.
- Forces related to gravity are usually invoked as secondary phenomenon within the framework of a more general driving mechanism such as mantle dynamics.
- This force is regarded as a secondary force and is often refersed to as "ridge push".

ORIGIN OF EARTH AND LIFE

Evolution refers to biological evolution of living things. But the process by which planets, stars, galaxies and universe form and long change over time are also type of evolution.

Origin of Universe - Huge expansion, called as Big Bang sent matter and energy expanding in all direction due to universe formed and expanded in all direction. With expansion, matter collected into clouds and condenses and rotate, forming galaxies. Our galaxy is Milky Way Galaxy.

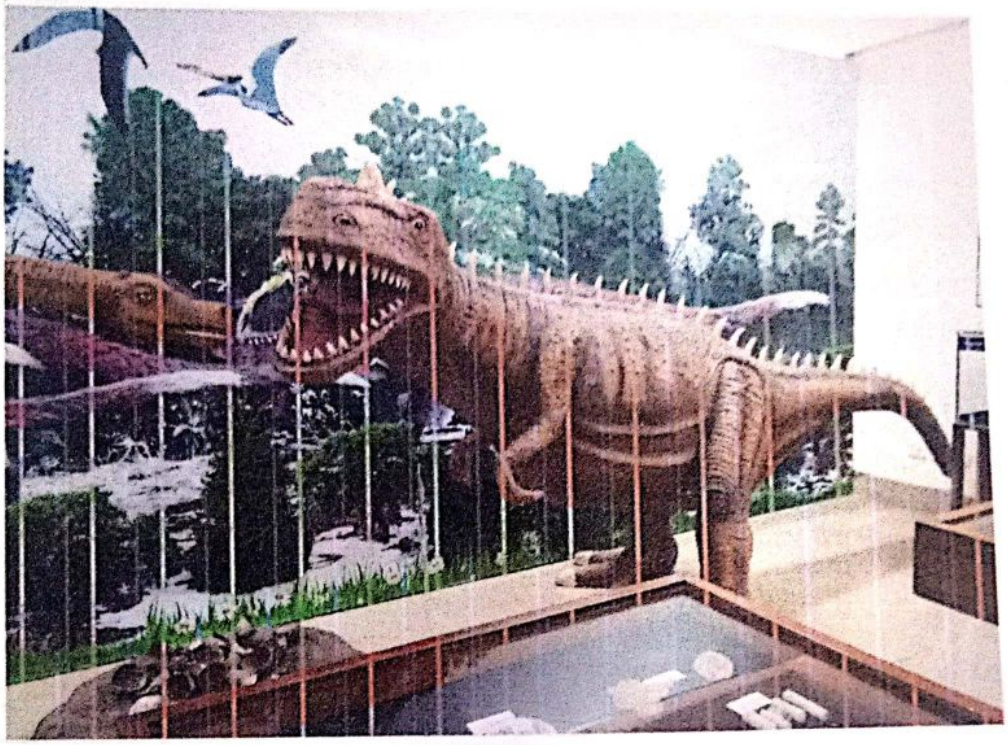
In successive stages, planets and their satellites formed. Rocky planets including earth were near sun, Gaseous planets were more distant.

Origin of Continents - Pangia was supercontinent that existed during late Paleozoic & Early Mesozoic Era. It assembled fro earlier continental units approx. 335 mya, it began to break about 175 mya.

Origin of life : Some theories which are responsible for the Origin of life.

1. Theory of Special Creation
2. Theory of Spontaneous Origin
3. Theory of Catastrophism
4. Theory of Biogenesis
5. Panspermia Theory
6. Terrestrial Abiogenic Origin
7. Great Oxygenation Event

Comets And Meteriates
Falling



Dinosaur fossil

PALEONTOLOGY

It is the Scientific study of life that existed prior to, and sometimes including the start of Holocene Epoch. It includes study of fossils to determine the organisms evolution and interactions with each other and their environment.

It lies between biology and geology but differs from archaeology in that it excludes study of anatomically modern humans.

We can say that Palaeontology is the study of ancient life. It focusses on record of past life but its main source of evidence is fossils, which are found in rocks.

Sources of Evidences of Palaeontology:- Body fossils, Trace fossils.

Palaeontology is divided into :-

Micropaleontology - Study of microscopic fossils
Paleobotany - Study of fossil plants
Palynology - Study of pollen and spores.
Vertebrate Palaeontology - Study of vertebrate animal fossils
Invertebrate Palaeontology - Study of invertebrate animal fossils
Palaeoecology - Study of ecology and climate of past
Ichnology - Study of fossil traces.

Topic : ..... Date. : ..... Page No. : .....

FOSSILS

Fossils are physical evidence of preexisting organisms either plants or animals.

Most common and obvious fossils are preserved skeletal remains of animals.

Fossils which are evidence of past organisms, include **leaf impressions, tracks and trails, burrows, droppings and root casts.**

Fossils of any kind are useful in 'reading the rock record'. They can help us to determine geological age and environment in which they were deposited.

Complete fossils make us understand the evolution better through geological time.

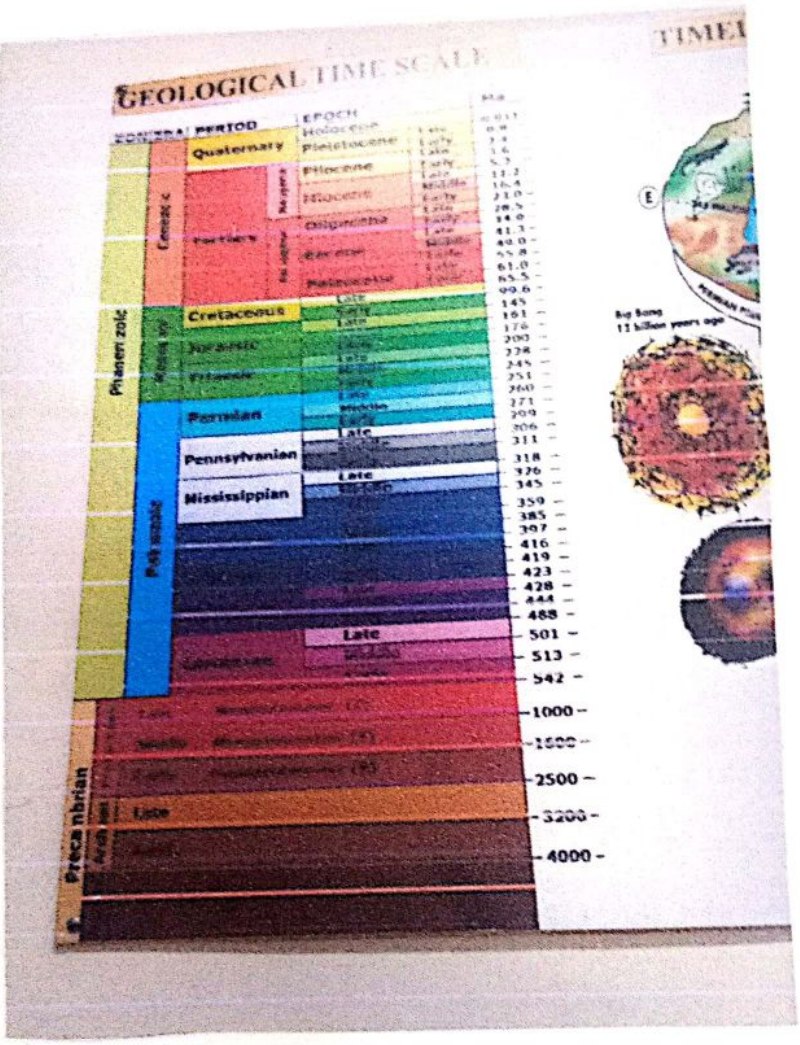
Law of Fossil Succession : The kinds of animals and plants founds as fossils change through time. We find same kinds of fossils in rock form different places, we know that rocks are the same age.

Geological Time Scale :

Earth is about 4.5 billion years old. Geologic Time Scale divides up this vast time interval.

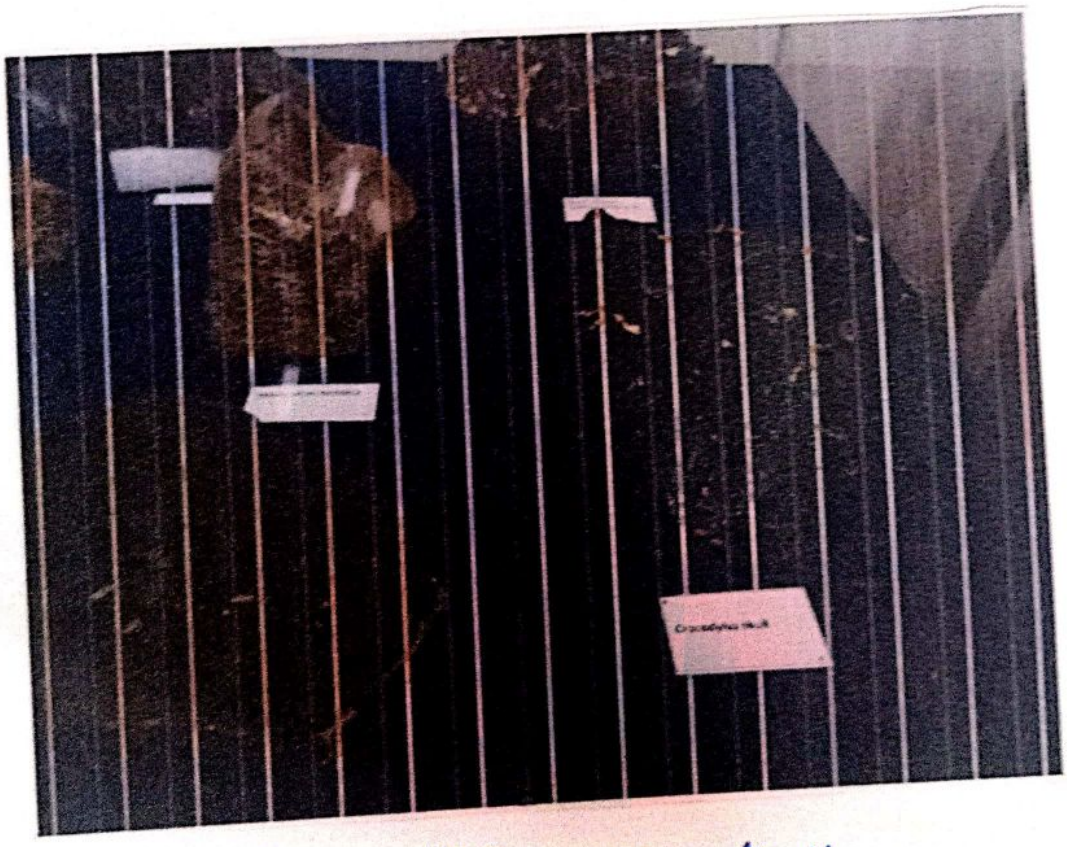
Oldest fossils are between 3 billion and 3.5 billion years old - These fossils of bacteria and for most of Earth history, life was simple.

Many complex animals appeared in oceans about 565 mya, become much more common about 542 mya.



Geological Time Scale

Fossils of Ammonite Shell



Fossils of Crocodylus Skull

Topic Date

Fossils found at Different Time Scale :-

1. Palaeozoic Era :- Earliest of three geologic eras of Phanerozoic eon :
longest from 541 to 251.902 mya. Subdivided into 6 geological periods
   1. Cambrian
   2. Ordovician
   3. Silurian
   4. Devonian
   5. Carboniferous
   6. Permian

Fossils :- a) Tail of calmanites b) Leptaena
c) Pygidium of Trilobites d) Portion of coal block.

2. Jurrassic Period :- It spanned 56 mya from end of Triassic period 201.3 mya. Its beginning of Cretaceous period 145 mya.
It is also of Age of Reptiles.

Fossils : a) Trigonia b) Penacrinites
c) Medlicia d) Dimorphoplites.

3. Cretaceous Period :- It was last and longest segment of Mesozoic era. It lasted approx. 79 mya from minor extinction event and that closed Jurassic period about 145.5 mya to the Cretaceous-Paleogene extinct event dated at 65.5 mya.

Fossils :- a) Bivalve c) lobster
b) Fossil stem d) Glechinites

Topic : ..... Date : ..... Page No. .....

4. Paleogene Period :- It span 43 mya from end of cretaceous period 66 mya to beginning of Neogene period 23.03 mya It is beginning of Cenozoic Era of Present phanerozoic Eon.

fossils :- a) Teredolites b) Fossil Crab
c) Cast of Giant Gastropods
d) large palm leaf.

Vertebrate fossils :- a) Stegodon b) Molars of elephas
c) Hipparia d) Tragulid

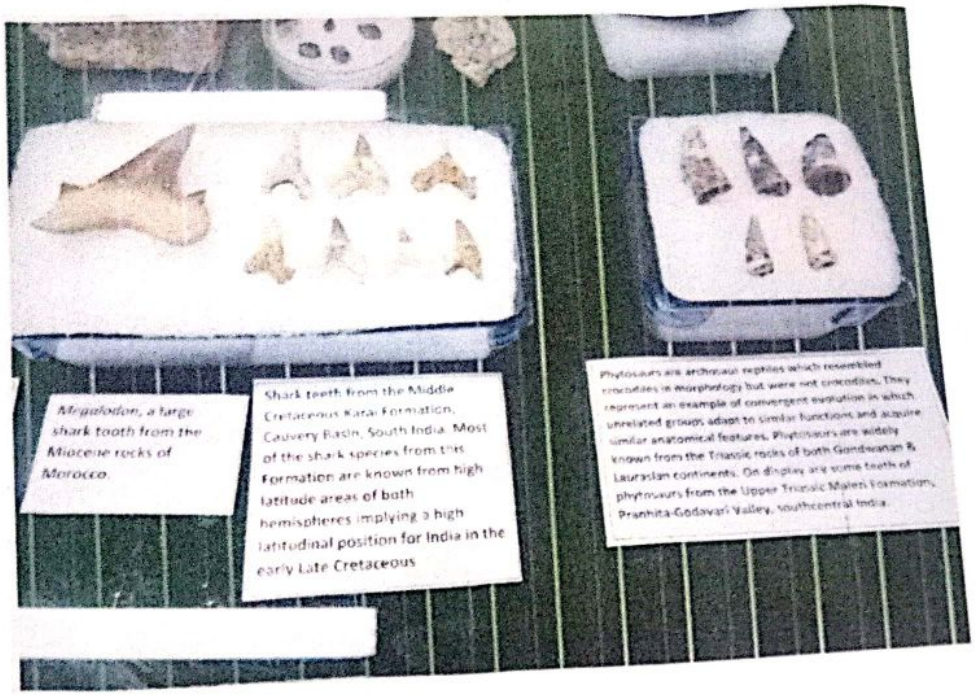
Invertebrate fossils :- a) fish spine b) Astrocyclina
c) Solitary coral

5. Neogene Period :- The second of three divisions of Cenozoic Era. It encompasses interval bw 23 mya and 26 mya and include Miocene & pliocene epoch. Neogene means new born designated as to emphasize that marine & terrestrial fossils

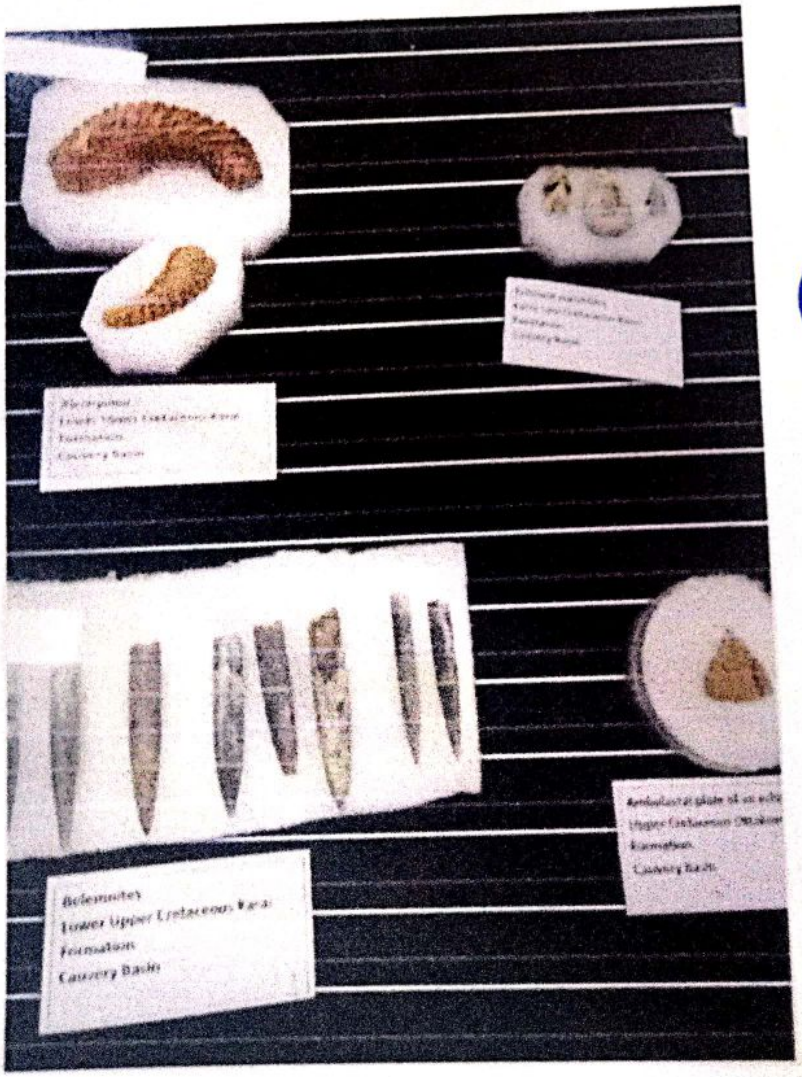
fossils :- a) Crocodylus skull b) Hipparion
c) Mammalian vertebra.

Some other fossils observed at Department of Geology :-

- Eurasian flora : a) Neuropteris b) Calamocladus
- Gondwana flora :- a) Fenestella b) Glossopteris
- Vertebrate fossils :- a) Tyrannosaurus b) Rhyncosaurus
c) Megalodon d) Crocodile teeth
e) Acanthus

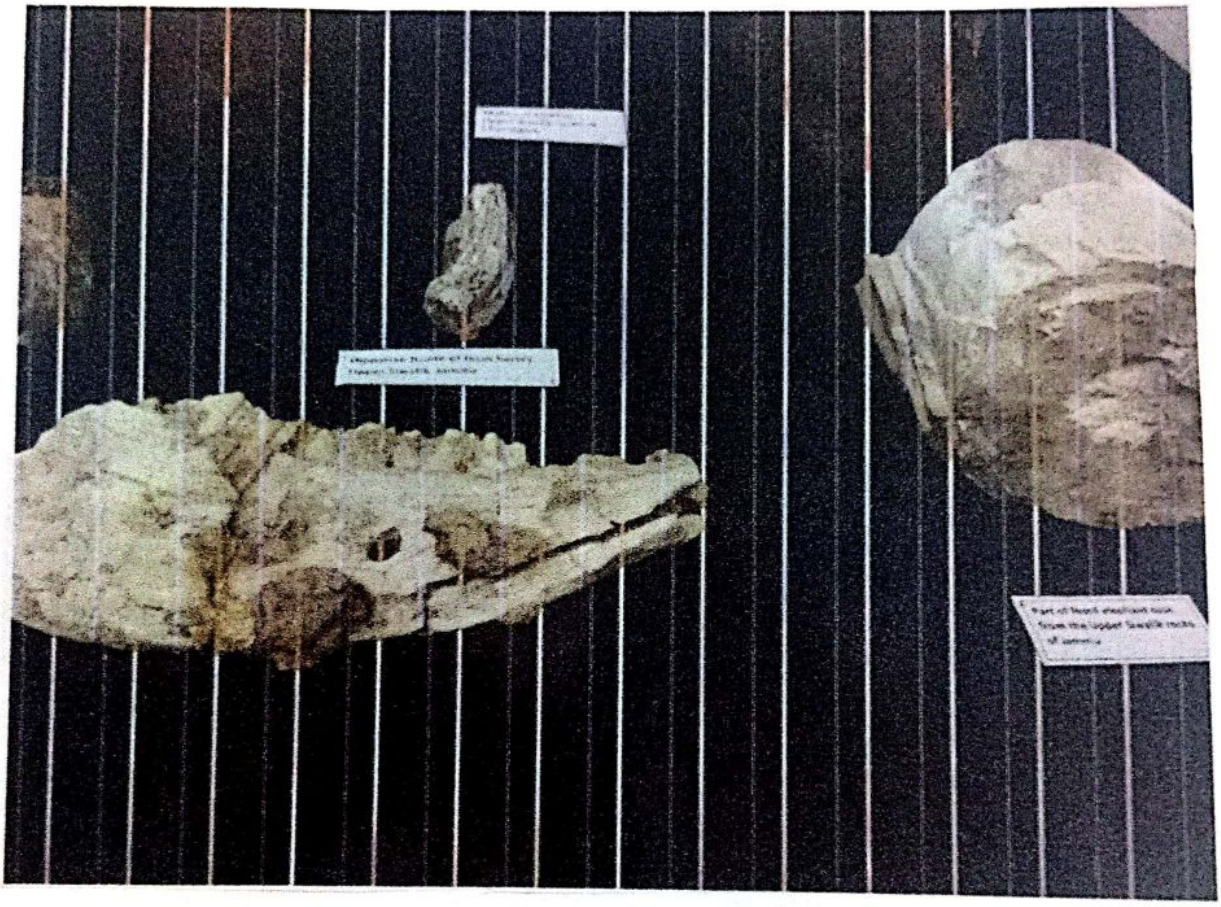


fossil of Shark Teeth found in Miocene



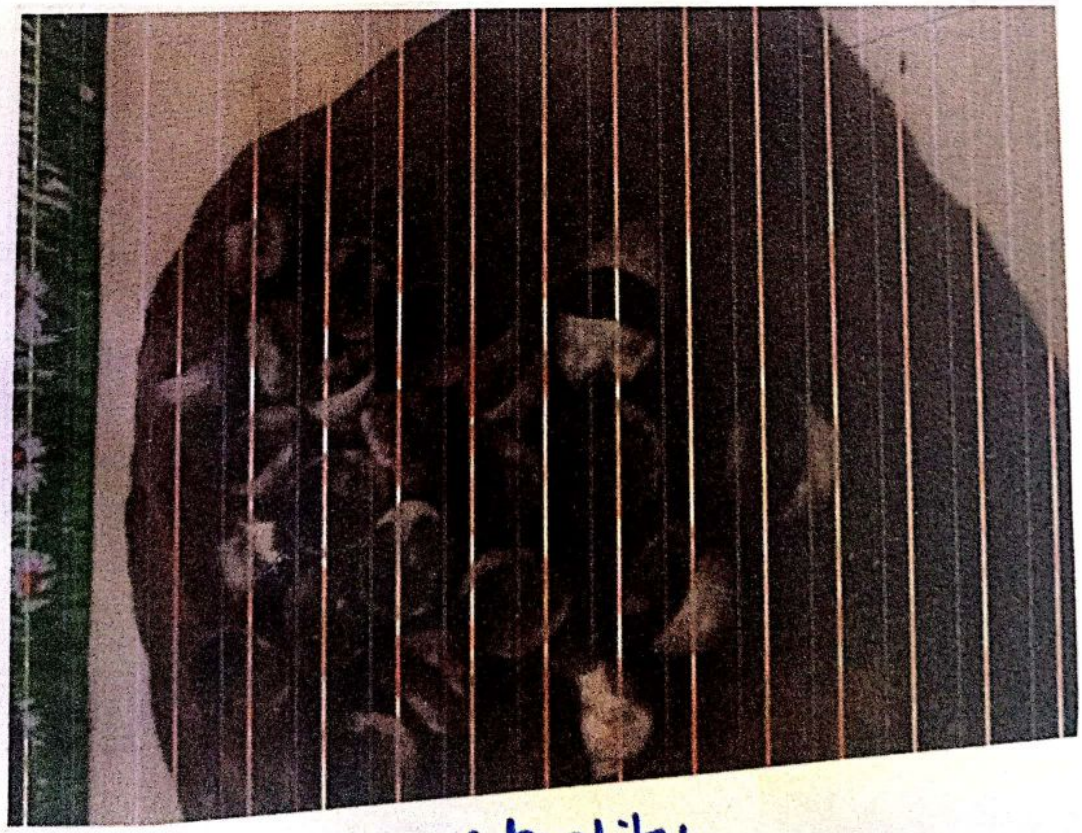
fossils found in Cretaceous period

Fossils found in different epoch.



Invertebrate fossils

Various Casts and Mold fossils.



Coprolites

Topic : ..... Date: .....

Types of fossils :-

1. Body fossils :- Fossils of hard parts of organisms such as shell, bone are c/a **Body fossils**.

2. Sub-fossils :- They are remain of animals and plants preserved in rocks less than 10,000 years before. It include remains of Bison trapped in frozen ice, in peat bags.

3. Microfossils :- Fossils remains of microscopic animals and plants which are usually less than 0.5 mm.

4. Macrofossils :- Fossils are larger than 1 cm in size. Include fossils of advanced plants and animals like clams, corals.

5. Unusual fossils :- Fossils formed by combination of events and condition result in organism getting preserved in rock.
   Eg:- a) Mammoths dung from Siberia.

6. Trace fossils :- Fossils of foot prints and trails left in mud by organisms like Dinosaurs foot prints, worm trails & clam burrows.

7. Coprolites :- Also trace fossils. They are fossils of dropping of faecal matters.

8. Bioclast :- Fragments of fossils enclosed in sediments.

9. Burrows and Borings :- Some animals live in burrows, tubes & holes in ground, wood or rocks for shelter in search of food. Burrows later filled with sediments and preserved.

10. Gastroliths :- They are found in abundance in body cavities of certain reptiles. They have used in grinding food.

11. Pseudofossils :- Objects of inorganic origin closely resemble forms of organic origin found in sedimentary rocks.

Formation of Fossils

1) Entire Organisms Preserved

a) Preservation in ice or permafast :- In Arctic Tundra of Siberia E.g. Lena Delta in 1790.

b) Fossils in petroleum springs and Asphalts :- Organisms fossilised in oil saturated soils. E.g. In Rancho fossil of la Brea.

c) Preservation in Resins and Ambers :- Insects entangled in sticky secretion of trees like resins secreted from Conifer tree. On exposure resin harden to Amber and insects and their larvae are preserved there.

d) Preservation In Peat :- Partly decomposed vegetable matter called peat produce water logged condition lacking oxygen and bacteria. Animals and plants are buried and preserved.

2) **Petrifaction** :- Most common method. Organisms are buried in sediments that continuously deposited on the floor of oceans or other large water bodies. Some buried organisms turn into fossils and embedded in rocks, while others are destroyed. Rocks formed are **Sedimentary / stratified rocks.**

3) Carbonisation :- Preservation of organic material like chitin, Sclerosprotein, cellulose and lignin.

4) Pytrisation :- Soft parts of buried plants and animals are replaced by pyrites formed under reducing conditions within sediments.

5) Compressions :- Mainly plant fossils. Formed by compression of buried plants, animals or their parts.

formation of fossils

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6) Moulds And Casts or Increstation fossils :- formed by hardening of material surrounding buried organisms. Hollow cavities if left they are moulds. If these cavities filled with natural deposits are casts.

4) Impressions :- left by vanished objects or their parts upon surrounding materials.

8) Mummies :- In Oeserts, bodies of animals & plants are dehydrated and preserved as Mummies.

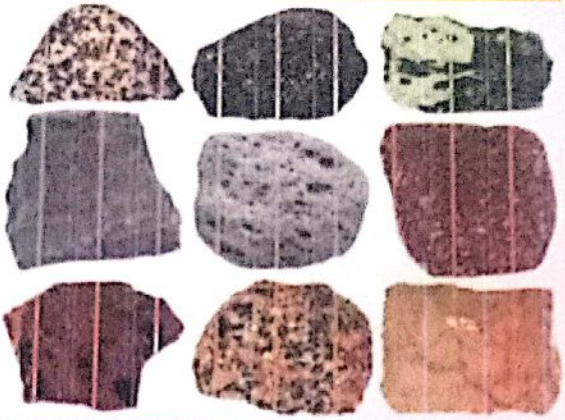
Different Types of Quartz

IGNEOUS ROCKS

Are the **oldest** types of rocks.

Considered the **mother** of all rocks.

Also called **primary** rocks.



Igneous Rocks

Types of Sedimentary Rocks

Sandstone

Limestone

Gypsum

Conglomerate

Shale

Sedimentary Rocks

Examples of Metamorphic Rocks

Metamorphic Rocks

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ROCKS AND STONES

There are main four categories :- Sedimentary, Metamorphic, Igneous and Man-Made stones :-

1. Igneous Rocks :- formed through volcanic material such as magma, cooled and solidified.
   Eg: Granite, fieldspar, potassium, Shpterite, Hematite.

2. Sedimentary Rocks :- come from organic material like glaciers, rivers, winds, oceans, and plants. They are bonded through million of years of heat & pressure.
   Eg. 1) limestone - Calcite, Calcite edward
   2) Sandstone - Crystalline quartz, mica, quartz.
   3) Soapstone - Soft stone, Coal ball.
   4) Fossil Stone - Volcanic ash.

3. Metamorphic Rocks :- Originated from natural form of one type of stone to another type through heat, pressure and minerals
   Eg. 1) Marble :- Dolomite, Calcite
   2) Slate :- Rock shale, Apophyllite, Magnesite.
   3) Serpentine :- Asbestos, Silimanite.

4. Man-Made or Quartz Stones :- Made of crushed stone bound together by an adhesive e.g :- marble & quartz.

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Phosphorescent And Fluorescent Stone

1. **Phosphorescent** :- Minerals that exhibit an afterglow when UV light is removed. It is a type of photoluminiscence.

   E.g. 1) Terlingua Calcite
   2) Non-Root Bear.

2. **Fluorescence**:- Minerals having ability to absorb small amount of light and on instead later release a small amount of light of different wavelength.

   Color change is spectacular when they are illuminated in dark by UV light and they release visible light.

   E.g. 1) Fluorescent Selinite Brader
   2) Blue Tip Calcite.

Different Types of Rock Sediments

Stilbite (Type of Sedimentary Rocks)

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OBSERVATION AND CONCLUSION

Department of Geology, Delhi University found to be very helpf to enhance and make us understand how beautiful our planet is with a lot of fossils found in different periods of eras. Different types of stones which can we observed these were not only beautiful but they found to be very useful.

Stones which are various colors add up to the beauty of our planet, found use in various field. Some big rocks are sculptured as temples like Kailash temple.

Origin of earth and origin of life are found to be most important and interesting part to know. It not only help us to know history of earth but also make us to know interesting facts.

Fossils help us to know about the history of planet, how life originated on earth, how they evolve according to environm

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REFERENCES

1. ^Holland, Heinrich D. "The Oxygenation of the Atmosphere and Oceans. Philosophical Transactions of the Royal Society : Biological Sciences.

2. ^Little, Fowler & Coulson 1990 and Wikipedia.org.

3. Plate Tectonics : Plate Boundaries.

4. Fossils And Palaeontology : Veer Bala Rastogi

5. Rocks And Stones :- Wikipedia.org.