

**All UG Courses - II<sup>nd</sup> Year (3<sup>rd</sup> Semester)  
Environmental and Road Safety Awareness  
Session: 2019-20, 2020-21 & 2021-22**

**Total Marks : 100 Max Time: 3 hrs.  
Theory : 60 marks Lectures per week 5  
Internal Assessment: 15 Credits 04  
(5 for Attendance & 10 for MST)  
Mandatory field visit to PG  
Science City & Report : 25 Marks**

**INSTRUCTIONS FOR THE PAPER SETTERS (Regular Students)**

The question paper will consist of three sections A, B and C. Each of sections A and B will have four questions from the respective sections of the syllabus. Each question shall carry 9 marks. Section C will consist of 12 short answer type questions of 2 marks each.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt any two questions from each section A and B. Section C is compulsory.

**PRIVATE/DISTANCE EDUCATION STUDENTS**

**Max Marks: 100 Max Time: 3hrs.  
Lectures per week 5**

**INSTRUCTIONS FOR THE PAPER SETTERS**

The question paper will consist of three sections A, B and C. Each of sections A and B will have four questions from the respective sections of the syllabus. Each question shall carry 15 marks. Section C will consist of 20 short answer type questions of 2 marks each.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt any two questions from each section A and B. Section C is compulsory.

**SECTION-A**

**INTRODUCTION TO ENVIRONMENTAL STUDIES:**

The multidisciplinary nature of environmental studies. Definition, scope and importance

Concept of Biosphere – Lithosphere, Hydrosphere, Atmosphere.



SHAHEED MAJOR HARMINDERPAL SINGH (S.C) GOVT. COLLEGE  
SAHIBZADA AJIT SINGH NAGAR

To

SSP Traffic and Road Safety

Sector – 23, Chandigarh Police

Dated:- 08.09.2022

Sub:- Road Safety and Traffic /Field Work/ Rally for students of the college.

Sir,

Environment and Road Safety Awareness subject is compulsory for BA IInd (Sem- III) students. Kindly allow our students to Traffic Park for Field work/ Rally/Workshop on 12<sup>th</sup> and 13<sup>th</sup> September, 2022. Approximately 450 students will be participating in this workshop.

Grant as permission and location for workshop.

*Harjeet Goyal*

Thanking you

Principal  
SMHS Government College  
S.M.H.S (S.C) GOVT COLLEGE  
SAHIBZADA AJIT SINGH NAGAR



Coordinator  
NAAC  
SMHS Government College  
Sahibzada Ajit Singh Nagar



SHAHEED MAJOR HARMINDERPAL SINGH (S.C) GOVT. COLLEGE

SAHIBZADA AJIT SINGH NAGAR

To

Date: 8.09.2022

The Principal,

S.M.H.S (S.C) Govt. College,  
Sahibzada Ajit Singh Nagar.

Subject:- About duty of Teachers for field visit of students regarding Environment and Road Safety Awareness

Respected Madam,


Mentioned teachers are put on two days duty for visit of students to Children Park, Sector- 23,

Chandigarh:-

1. Prof. Tejinder Kaur (Psychology)
2. Prof. Shallu Devi (Botany)
3. Prof. Guljit Singh (Computer Science)
4. Prof. Ravinder Kaur (Economics)
5. Prof. Rohini Devi (Commerce)
6. Prof. Hanish Guretia (Physical Education)
7. Prof. Amandeep Singh (GCMSIP)
8. Prof. Johny (HATS)

*Harjeet Goyal*

Principal  
SMHS Govt. College  
Sahibzada Ajit Singh Nagar

  
Coordinator

NAAC  
SMHS Government College  
Sahibzada Ajit Singh Nagar



## Report on the Field work/Field visit on Environment and Road Safety Awareness

S.M.H.S College, Phase 6, SAS Nagar, Mohali organized a Field Visit/ Rally of two days on 12<sup>th</sup> September and 13<sup>th</sup> September, 2022 at Children Traffic Park, Sector-23, Chandigarh. Approximately 450 students of BA II(Sem III) participated in this visit.

**Type:-** Field visit/ Rally

**Place of visit:-** Children Traffic Park, Sector-23, Chandigarh

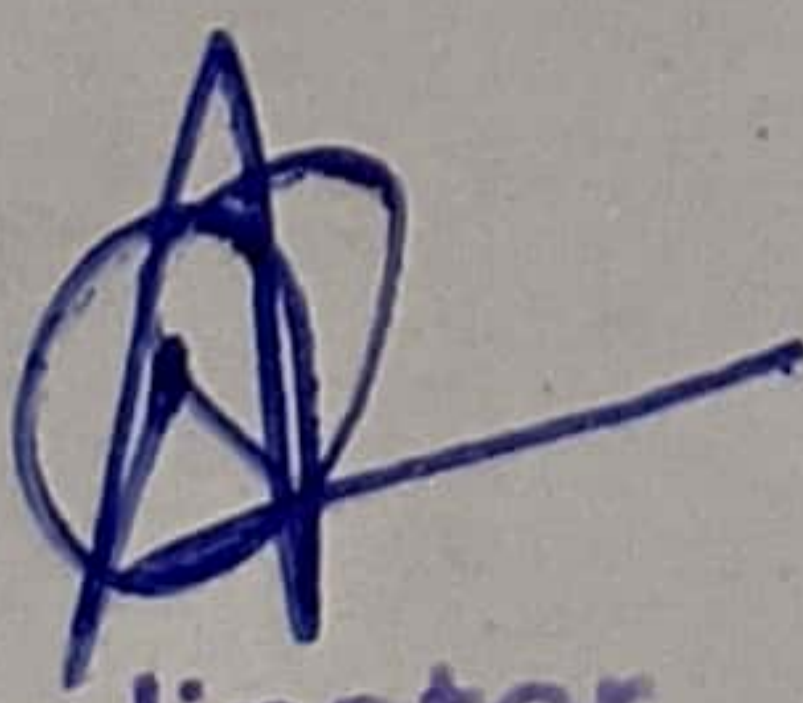
**Duration:-** Two days

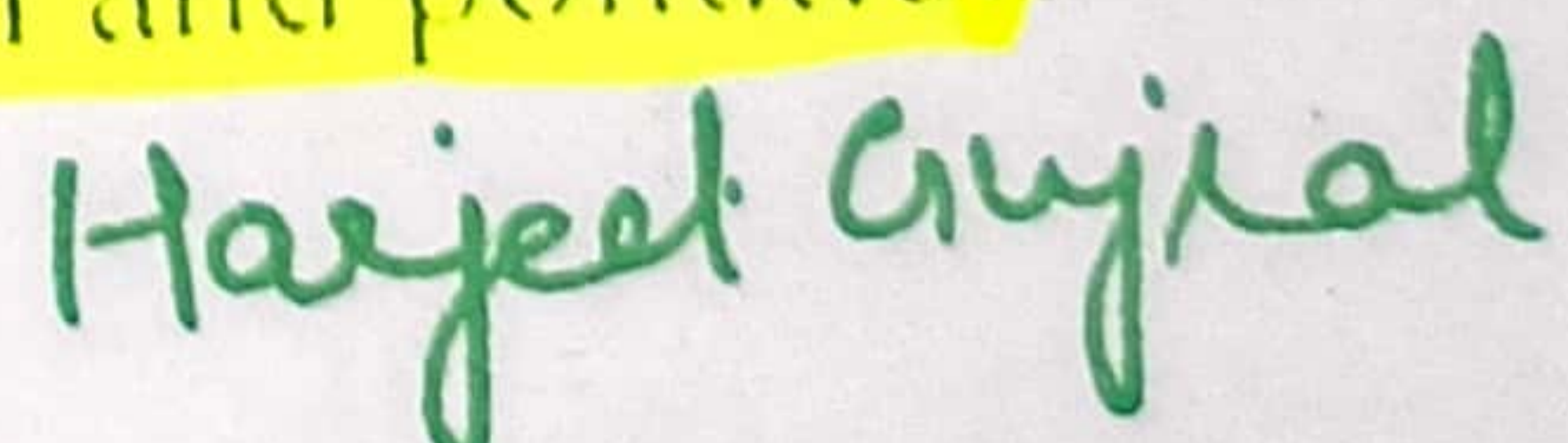
### Workshop Highlights:-

1. This visit was designed to provide awareness among the students regarding Traffic rules.
2. To encourage students to learn basic Road Safety rules.
3. Students were motivated to follow Traffic lights as well as wearing Helmets while riding two-wheelers.
4. It was compulsory for the students to wear seat belt while driving Cars.
5. Students learnt not to blow Horn while on Red Light.

### Outcomes:-

1. To increase and completely remove out the road accident deaths.
2. To spread awareness regarding keeping Environment clean and pollution free.

  
Coordinator  
NAAC  
SMHS Government College  
Sahibzada Ajit Singh Nagar

  
Principal  
SMHS Govt. College  
Sahibzada Ajit Singh Nagar



**B. A./B.Sc. PART-III (SEMESTER - VI)**  
**SESSION for 2022-23, 2023-24, 2024-25**  
**PRACTICAL GEOGRAPHY: FIELD METHODS IN GEOGRAPHY**

Max. Marks: 40

Pass Marks: 35%

Session-I (Morning)

Total Marks: 18

(Theory paper)

Time: 3 Hours

Four exercises should be given, out of these, candidate is required to attempt any three. Each exercise will carry six marks. The paper will be set by the examiner at the centre on the spot.

Session-II, Evening (Field Survey & Practical Record)

Total Marks: 22

Time: 3 Hours

Total Lectures: 27

Distribution of Marks

Field Report

15 Marks

Viva-voce

07 Marks

SECTION-A

- Fieldwork:** (i) Nature Scope, Objective and Significance of Field Studies. (3 Lectures)  
 (Theory) (ii) Role of fieldwork in geography. (3 Lectures)  
 (iii) Scale of study and fieldwork methodology. (3 Lectures)  
 (iv) Methods of field study of: a farm, a village, and a town. (3 Lectures)

SECTION-B

- (v) Type of Data in Geography: Primary and Secondary. (3 Lectures)  
 (vi) Methods of collecting primary data: questionnaire, observation and measurement. (3 Lectures)

**Fieldwork (Practical):**

A field report of 10 to 15 written pages will be prepared based on primary data on problems such as (a) local market survey, (b) service area of school/hospital; (c) traffic flow, and (d) socio-economic characteristics of students/village/mohalla/sector.

(9 Lectures)

**BOOKS RECOMMENDED**

1. Archer, J.E. & Dalton, T.H. : *Fieldwork in Geography*, E.T. Bastford Ltd., London, 1968..
2. Hudson, F.S. : *A Geography of Settlements*, MacDonal, London, 1970.
3. Jones, P.A. : *Fieldwork in Geography*, Longman, London, 1968.
4. Kellaway, George P. : *Map Projections*, Methuen and Co., London.
5. Singh, Gopal : *Mapwork and Practical Geography*, Surjeet Book Depot, Delhi, 1993.
6. Singh, L.R. and Singh, Raghunandan : *Mapwork and Practical Geography*, Central Book Depot, Allahabad, 1993.
7. Steers, J.A. : *Map Projections*, University of London Press, London.
8. Jones, Alun : *Fieldwork in Geography*, Longman Green Co., London, 1968.

*V. Singh*  
 13.04.2022

*Harjeet Arjyal*

Principal  
 SMHS Govt. College  
 Sahibzada Ajit Singh Nagar



ਮੇਰਾ ਵਿਸ਼ੇ,

ਪ੍ਰਿੰਸੀਪਲ ਮਾਹਿਲਾ  
ਸ.ਮ.ਹ.ਸ. ਸਿ (ਸੇਕੰਡਰੀ ਕਾਲਜ ਮੋਹਾਲੀ)  
ਸਰਕਾਰੀ ਕਾਲਜ ਮੋਹਾਲੀ।

G.C.M.S.P  
M.O. Teer Mahila  
Sahibzada Ajit Singh Nagar

Harjeet Singh  
Principal  
SMHS Govt. College  
Sahibzada Ajit Singh Nagar

ਵਿਸ਼ੇ: ਦਰਸ਼ਨ ਕਰਵਾਉਣ ਦੀ ਸੇਵਾ।

ਮੁੱਖ ਮੰਤਰੀ ਜੀ, ਬੇਨਤੀ ਹੈ ਕਿ ਚਾਇਲਡਰਨ ਵਿਭਾਗ ਦੇ ਵਿਦਿਆਰਥੀਆਂ ਦੇ ਕੋਲ ਸੇਵਾ  
D.N.A Isolation ਵਿਸ਼ੇ ਤੇ ਸਿਤੀ 28/4/2023 ਅਤੇ 29/4/2023 ਨੂੰ  
ਦਰਸ਼ਨ ਆਯੋਜਿਤ ਕਰਨ ਦੀ ਆਗਿਆ ਦਿਤੀ ਜਾਵੇ।

ਪੰਜਾਬ ਸਰਕਾਰ

ਆਪ ਜੀ ਦੀ ਆਗਿਆਕਾਰੀ  
ਸ਼੍ਰੀ. ਜਸਵੀਰ ਕੌਰ  
(ਚਾਇਲਡਰਨ ਵਿਭਾਗ)

ਸਿਤੀ  
21/04/2023

(English version of  
permission application)

To

The Principal  
S.M.H.S. Govt. College  
Mohali

Subject: To seek permission regarding workshop.

Respected Man,

With due respect, we wish to conduct workshop  
on DNA isolation as per requirement acc. to syllabus  
on 28<sup>th</sup> - 29<sup>th</sup> April, 2023. Kindly allow us to conduct  
the same and oblige.

Yours Sincerely  
Jasvir Kaur  
Biology Dept.



# NOTICE

## S.M.H.S. Government College, Phase 6, Mohali

### Department of Biotechnology

The Department of Biotechnology at S.M.H.S. Government College, Phase 6, Mohali, is delighted to announce a comprehensive workshop on DNA Isolation Technology & Molecular Biology Techniques. This workshop is being conducted in collaboration with Escherchia Genomic P. Ltd., on 28-29<sup>th</sup>, April, 2023

This workshop is designed to provide participants with hands-on experience and in-depth knowledge of the following:

- DNA Isolation Techniques
- Gel Electrophoresis Techniques
- DNA Fingerprinting Analysis Method (Lecture)

Registration Fee: Rs. 400/-

Registration Deadline: 22 April, 2023

This workshop is open to students, interested in the field of biotechnology, genomics, and molecular biology. Limited seats are available, so early registration is encouraged.

**Give your registration to Mrs. Jaskirat Kaur, Faculty, Department of Biotechnology**

- Upon workshop completion, an evaluation test will assess understanding. Certificates will be provided to participants passing the evaluation.

*Don't miss this unique opportunity to enhance your knowledge and skills in the exciting field of biotechnology and genomics. Join us for this enlightening workshop and be a part of the future of molecular biology*

*Jaskirat Kaur*  
Co-ordinator

*Harjeet Goyal*

Principal  
SMHS Govt. College  
Sahibzada Ajit Singh Nagar  
Principal





# A Workshop On DNA Isolation Technology & Molecular Biology Techniques



ORGANISED BY :

**DEPARTMENT OF BIOTECHNOLOGY (GCMSIP)**

**Shaheed Major Harminderpal Singh (Shaurya Chakra)  
Govt. College, S.A.S. Nagar (Mohali)**

In Collaboration With

**Escherchia Genomics P. Ltd. New Delhi**

**On 28th-29th, April 2023**

## SALIENT FEATURES OF WORKSHOP

- DNA Isolation from 7 Different Sources.
- Gel Electrophoresis Techniques
- DNA Fingerprinting Analysis Method (Lecture)

Certificate  
will be  
given to  
participants

## REGISTRATION FEES

**Rs. 400/-**

**LIMITED SEATS**

## ORGANISING COMMITTEE

**CHIEF PATRON**

Mrs. Harjit Gujral  
Principal  
Cum CEO, GCMSIP

**Mrs Anureet Bhalla**

Member Secretary  
(GCMSIP)

**Dr. Mandeep Kaur**

Member Secretary H.O.D  
(Biotechnology)

**Mrs. Jaskirat Kaur**

Teaching Faculty  
(Biotechnology)

Contact For Registration:

**Ms. Jaskirat Kaur 82838-71978**

Email: [biotechnologygcmsip@gmail.com](mailto:biotechnologygcmsip@gmail.com) | Website: [www.gcmohali.com](http://www.gcmohali.com)



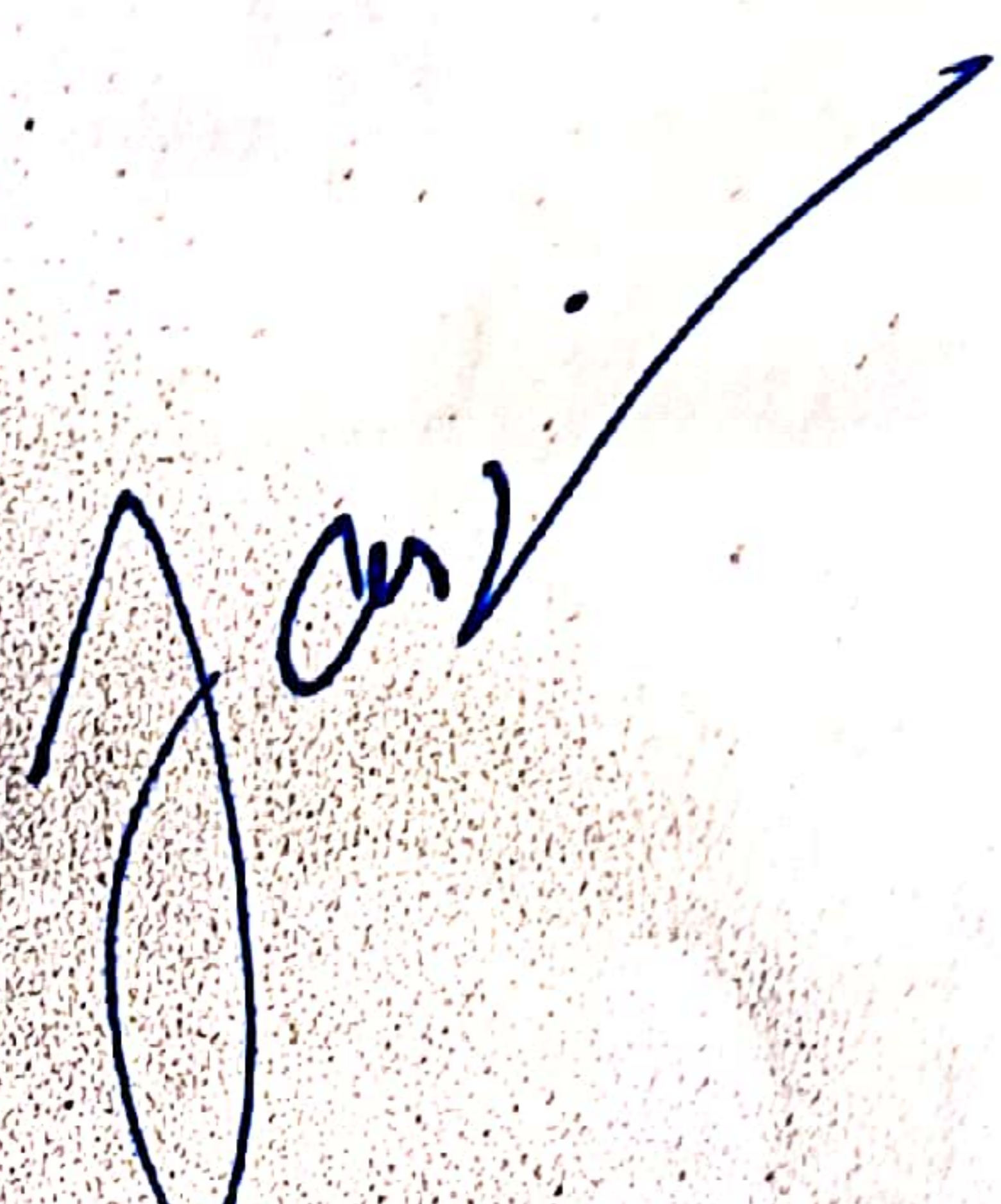
**S.M.H.S. Government College, Sahibzada Ajit Singh Nagar**  
**Department of Biotechnology (GCMSIP)**  
**SCHEDULE OF WORKSHOP**

**DAY-1**

9.30 AM -10.00 AM	Inauguration of Workshop by Mrs. Harjit Gujral, Principal
10.00 AM-10.15 AM	Tea
10.30 AM-01:30 PM	Practical Session-I
01.30 AM-02.00 PM	Lunch
02:15 PM-04.00 PM-	Practical Session-II
04.00 PM -05.00 PM	Lecture-I

**DAY-2**

9.30 AM -01.30 PM	Practical Session-III
01.30 AM-02.30 PM	Lunch
03.00 PM-04.00 PM	Practical Session-IV
04.00 PM-4.30 PM	Valedictory.
04.30PM-05.00PM	Tea



Harjit Gujral

Principal  
SMHS Govt. College  
Sahibzada Ajit Singh Nagar



S.M.H.S. Government College, Sahibzada Ajit Singh Nagar  
Department of Biotechnology (GCMSIP)

**ATTENDANCE DURING WORKSHOP**

S.No	Name of Participants	Day-I Date: <u>28-04-2023</u>	Day-II Date: <u>29-04-2023</u>
1	Sheetal	Sheetal	Sheetal
2	Sirjia	Sirjia	Sirjia
3	Sukhjet Kaur	Sukhjet	Sukhjet
4	Simran Kaur	Simran	Simran
5	Ramanpreet Kaur	Ramanpreet Kaur	Ramanpreet Kaur
6	Deepakshi	Deepakshi	Deepakshi
7	Sandeep Kaur	Sandeep	Sandeep
8	Kulwinder Kaur	Kulwinder	Kulwinder
9	Simran Devi	Simran	Simran
10	Taranpreet Kaur	Taranpreet Kaur	Taranpreet Kaur
11	Lovepreet Kaur	Lovepreet Kaur	Lovepreet Kaur
12	Komal	Komal	Komal
13	Baljeet Kaur	Baljeet Kaur	Baljeet Kaur
14	Sachin	Sachin	Sachin
15	Aman Kumar	Aman	Aman
16	Simmi	Simmi	Simmi
17	Ekta	Ekta	Ekta
18	Kamika	Kamika	Kamika
19	Sandeep	Sandeep	Sandeep
20	Abhishek	Abhishek	Abhishek

*Jari*

*Harjeet Arora*

Principal  
SMHS Govt. College  
Sahibzada Ajit Singh Nagar







Deepakshi, Bsc Biotech (Mons)

3657

Department of Biotechnology,  
SMHS Govt. College, Mohali  
Workshop 28-29 April, 2023

22  
30

Questionnaire

Marks:15

Choose one answer among the multiple choice questions.

Que. 1. How do you get to know about Escherichia Genomics Private Limited:

1. Newspaper
2. Internet
3. Teacher
4. Company

Que. 2 Workshop will be useful as students will get exposure to:

1. Learn gel electrophoresis
2. Hands on experience
3. Skill development
4. All the above

Que 3. Which of the following reagent is commonly used for bacterial cell lysis:

1. CTAB
2. Phenol extraction
3. Lysozyme
4. Penicillin

Que 4. Which of the following reagents are used for precipitating DNA:

1. Chloroform
2. Ethanol
3. NaCl
4. None of these

Que 5. Which of the following is in the correct order regarding DNA extraction:

1. RNAase treatment > Protease treatment > Cell lysis > ethanol precipitation
2. Cell lysis > phenol treatment > RNAase treatment > ethanol precipitation
3. Cell lysis > RNAase treatment > Protease treatment > ethanol precipitation
4. Cell lysis > phenol treatment > Protease treatment > ethanol precipitation

Que 6. Which technique separates charged particles using electric field?

1. Hydrolysis
2. Electrophoresis
3. Protein synthesis
4. Protein denaturing

Que. 7. For the separation of DNA by electrophoresis, which of the following method is commonly used?

1. Agarose - vertical
2. Agarose - horizontal
3. PAGE - vertical
4. PAGE - horizontal

Harjeet Arjyal



Jasveer

BSc Biotech Sem-2

Department of Biotechnology,  
SMHS Govt. College, Mohali  
Workshop 28-29 April, 2023

24  
30

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Harjeet Arora

Principal  
SMHS Govt. College  
Gandiana, All. Singh Nagar



ROHIT KUMAR

Class - BSc (H) Biotech 3rd year

Roll No - 3753

Department of Biotechnology,  
SMHS Govt. College, Mohali  
Workshop 28-29 April, 2023

Questionnaire

22  
/ 30

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Harjeet Arora

Principal College



Roll no. → 3712  
Sem-4th  
B.Sc. Biotechnology  
Aman Kumar

24  
30

Department of Biotechnology,  
SMHS Govt. College, Mohali  
Workshop 28-29 April, 2023

### Questionnaire

Choose one answer among the multiple choice questions.

Marks:15

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Harjeet Arjial

Principal  
SMHS Govt. College  
Sahibzada Ajit Singh Nagar



**EVALUATION OF STUDENTS FOR DNA WORKSH**  
**TOTAL MARKS = 50 MARKS, WRITTEN TEST+ VIVA ( 30 MARKS + 20 MARKS )**

Sr No.	ROLL NO.	NAME	CLASS (B.Sc Biotechnology)	MARK OBTAINED
1	3751	EKTA	3 rd year	45
2	3752	ABHISHEK	3 rd year	44
3	3753	ROHIT	3 rd year	40
4	3754	KANIKA	3 rd year	42
5	3755	SANDEEP	3 rd year	45
6	3756	SIMMI	3 rd year	41
7	3757	VEERPAL KAUR	3 rd year	35
8	3701	TARANPREET KAUR	2 nd year	32
9	4202	LOVEPREET KAUR	2 nd year	32
10	4203	SACHIN	2 nd year	38
11	4204	HARMANPREET KAUR	2 nd year	35
12	4205	ROHIT	2 nd year	45
13	4206	SIMRAN	2 nd year	35
14	4207	JASVIR SINGH	2 nd year	42
15	4208	GAGANAJEET	2 nd year	44
16	4209	BALJEET KAUR	2 nd year	38
17	4210	ANIKET	2 nd year	36
18	4211	KOMAL	2 nd year	42
19	4212	AMAN	2 nd year	44
20	3651	SUKHJEET	1st year	43
21	3652	SANDEEP	1st year	42
22	3653	MAMTA	1st year	32
23	3654	RAMANPREET	1st year	43
24	3655	KULWINDER	1st year	46
25	3656	JASMINE	1st year	38
26	3657	DEEPAKSHI	1st year	36
27	3658	SIRJANA	1st year	40
28	3659	RAHUL	1st year	34
29	3661	SIMRAN	1st year	42
30	3663	SHEETAL	1st year	40
31	3664	SINGH	1st year	38

*Jain*

*Harjeet Arora*

Principal  
 SMHS Govt. College  
 Sambalada Ajit Singh Nagar



*Singh*

Advance Hands on DNA Workshop: by Escherichia Genomics P.ltd New Delhi

**Advance Hands on DNA  
Workshop: by  
Escherichia Genomics  
P.ltd New Delhi**

amount of DNA storage buffer and elutes were store in new sterile tube in deep freezer.

**Chemicals and Buffer:**

1. DNA Isolation Buffer
2. Protein Precipitation Solution
3. DNA Precipitation Solution
4. DNA Desalting Solution
5. DNA Storage Solution

**Protocols :**

DNA isolation experiments comprise of seven steps/ principle 1. Sample selection, 2. Sample homoginaization, 3. Cell lysis, 4. Protein precipitation, 5. DNA precipitation, 6. DNA Desalting /washing and 7.DNA elution/storage.

1. **Sample Selection:** soft and new tissue, easy to handle, easy to grind , easy to cell lysis and free from contamination,
2. **Sample Homogenization:** Maintain as low temp, sound and stroke.
3. **Cell lysis:** cell lysis is key steps in DNA isolation experiments. Cell lysis methods change as cell /tissue sample change e.g. blood sample, plant sample, heart, leaver kidney sample. After cell lysis 4 last steps are common in all type of sample/cell/tissues.
4. **Protein precipitation:** in this step protein is separated from DNA strand and all other protein precipitated by treating with (Chloroform Isoamyl alcohol (24:1)).
5. **DNA Precipitation:** Absolutes chilled Propane - 2ol (Isopropanol) use to precipitate the DNA and separate from.buffer solution.
6. **DNA Desalting and or Washing**  
70% ethanol use to wash the DNA Sample.
7. **DNA Elution/DNA Storage:** after desalting sample left open to evaporate the traces of alcohol and then 100 µl DNA Storage (TE Buffer or Double Distilled Sterile Water) or suitable

S.No	Items Name	Stock Conc.	Working Conc.	100ml
1	Tris HCl (pH 8.0)	1M	100mM	10ml
2	EDTA.Na <sub>2</sub> (pH 8.0)	0.5M	50mM	10ml
3	NaCl	5M	1.4M	28ml
4	CTAB <sup>PIF</sup> SDS <sup>Arirais</sup>	20%	2%/1%	10ml
5	D.D.Sterile H <sub>2</sub> O	---		42ml
Total				100ml
<b>Common Solution and Buffer</b>				
1	Protein Precipitation sol.	(Chloroform Isoamyl alcohol (24:1).		
2	DNA Precipitation sol.	Absolute Iso-propanol (100%)		
3	DNA Desalting Sol.	70% Ethanol		
4	DNA Storage Buffer(T <sub>10</sub> E <sub>1</sub> buffer)	10mM TrisHCl (pH 8.0), 1mM EDTA.Na <sub>2</sub> (pH 8.0)		
<b>Electrophoresis Buffer</b>				
1.	TAE	40mM Tris 1mM EDTA		
2	TBE	45mM Tris 1mM EDTA.Na <sub>2</sub>		
3	Loadin g Dye	It contains two different dyes (bromophenol blue and xylene cyanol FF) for visual tracking of DNA migration during electrophoresis	30% (v/v) glycerol. 0.25% (w/v) bromophenol blue. 0.25% (w/v) xylene cyanol FF. Store at 4°C.	
4	Etbr	10 mg/ml	0.5 µg/ml working solution	
RBC Lysis Buffer: 0.32M Sucrose 5mM MgCl <sub>2</sub> 1% Triton X-100 10mM Tris-HCl, pH 7.6.				
WBC Lysis Buffer (10 mM Tris _HCl, 26 mM EDTA, 17.3 mM (0.5%) SDS)				
DNA Storage Buffer: Tris HCl (pH 8.0) and EDTA.Na <sub>2</sub> (pH 8.0)				

Escherichia Genomics P.ltd : 42 A-Hasanpur Village IP Extention Delhi-110092 Mobile 9560757331 (WhatsAPP),  
7835824218,9711072091 [www.dnamarts.com](http://www.dnamarts.com), Email: [escherichia4@gmail.com](mailto:escherichia4@gmail.com), [DNAmarts@gmail.com](mailto:DNAmarts@gmail.com),  
[Hello2dna@gmail.com](mailto>Hello2dna@gmail.com)



Youtube: [HelloDNA](https://www.youtube.com/channel/UC...) and [Escherichia Genomics](https://www.youtube.com/channel/UC...)



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# Advance Hands on DNA Workshop: by Escherichia Genomics P.ltd New Delhi

- 1. Sample Selection:** soft and new tissue, easy to handle, easy to grind, easy to cell lysis and free from contamination,
- 2. Sample Homogenization:** Maintain as low temp, sound and stroke.

## Plant /Fungal Cell Lysis:

1. Take 100mg plant/fungal sample
2. Add 800µl DNA Isolation Buffer
3. Incubate @ 65 °C for 30 to 60 minutes
4. Mix gentle @ 10 minutes interval.

## RBC Lysis:

1. Take 100 µl fresh blood sample
2. Add 800 µl RBC Lysis buffer
3. Shake @ full speed.
4. Centrifuge @5000rpm for 5 minutes.
5. Discard Supernatant and save WBC @ bottom of tube.

## WBC Lysis:

1. Add 800 µl WBC Lysis.
2. Break with micropipette by take in and out WBC in tip.
3. Repeat in and out till cell cleared.

## Saliva Cell Lysis:

1. 100 µl saliva sample
2. Add 800µl DNA Isolation Buffer
3. Incubate @ 65 °C for 30 to 60 minutes
4. Mix gentle @ 10 minutes interval.

## Bacterial Cell Lysis:

1. 1000 µl Broth culture OD 0.5.
2. Centrifuge 5000rpm and discard the supernatant.
3. Add 800µl DNA Isolation Buffer
4. Incubate @ 65 °C for 30 to 60 minutes
5. Mix gentle @ 10 minutes interval.

## Protein Precipitation:

1. Add 600 µl Chloroform Isoamyl Alcohol (24:1)
2. Gentle mix by inverting tube 10 minutes.
3. Centrifuge @ 1500rpm for 15 minutes.
4. Transfer Supernatant in new tube.

## DNA Precipitation:

1. Add equal volume of chilled Isopropanol.
2. Mix well by inverting the tube for 5 minutes.
3. Centrifuge @ 10000rpm for 10 minutes.

4. Discard the supernatant and save the pellets.

## DNA Washing:

1. Add equal volume of 70% ethanol.
2. Mix well by inverting the tube for 5 minutes
3. Centrifuge @ 10000rpm for 10 minutes.
4. Discard the supernatant and save the pellets.

## DNA Storage:

1. Let tube open for 20 to 60 minutes to evaporate the ethanol.
2. Add 100 µl of DNA Storage buffer or Double distilled sterile water(Short term Storage)
3. Transfer the elute in new sterile tube and with proper label store in deep freez.

## Agarose Gel Electrophoresis:

1. Wash all operates before use
2. Weigh 0.8g of Agarose powder and mix with 1X TAE Buffer.
3. Boil the Agarose powder in 500ml conical flask.
4. Cool and Add 5 µl ETBR dye and mix well.
5. Pour in Gel Casting Tray Seal from two sides.
6. Set the comb at Suitable space.
7. Once Gel cool removes camb and transfer in electrophoresis tank.
8. Load DNA Sample by mixing with 2ul of Gel Loading Dye.
9. Run electrophoresis with 100v~150v Currents (5volt/cm electrode distance current )
10. Once gel run suitable distance see DNA band on UV Transilluminator

## PCR Reaction:

Item Name	Single raction	10 reaction
PCR Grade H2O	16.5 µl	165 µl
Taq Buffer	2.5 µl	27.5 µl
dNTP Mix	2.0 µl	20 µl
Primer F	1 µl	10 µl
Primer R	1 µl	10 µl
Taq Polymerase	1unites	10 unites
DNA Template	2 µl	2 µl
	Total	25 µl

Always prepare one plus sample on 10 sample prep. (10+1)

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[Hello2dna@gmail.com](mailto>Hello2dna@gmail.com)

Escherichia Genomics

Youtube: [HelloDNA](https://www.youtube.com/channel/UCqjgkAuyhoh) and [Escherichia Genomics](https://www.youtube.com/channel/UCqjgkAuyhoh)

Escherichia Genomics

Principal  
 Smt. Govt. College  
 Sahibzada Ajit Singh Nagar



# DNA Fingerprinting and Analysis Methods

used in the study of animal and floral populations and in the fields of zoology, botany, and agriculture.

DNA profiling (also called DNA fingerprinting, DNA testing, or DNA typing) is the process of determining an individual's DNA characteristics,

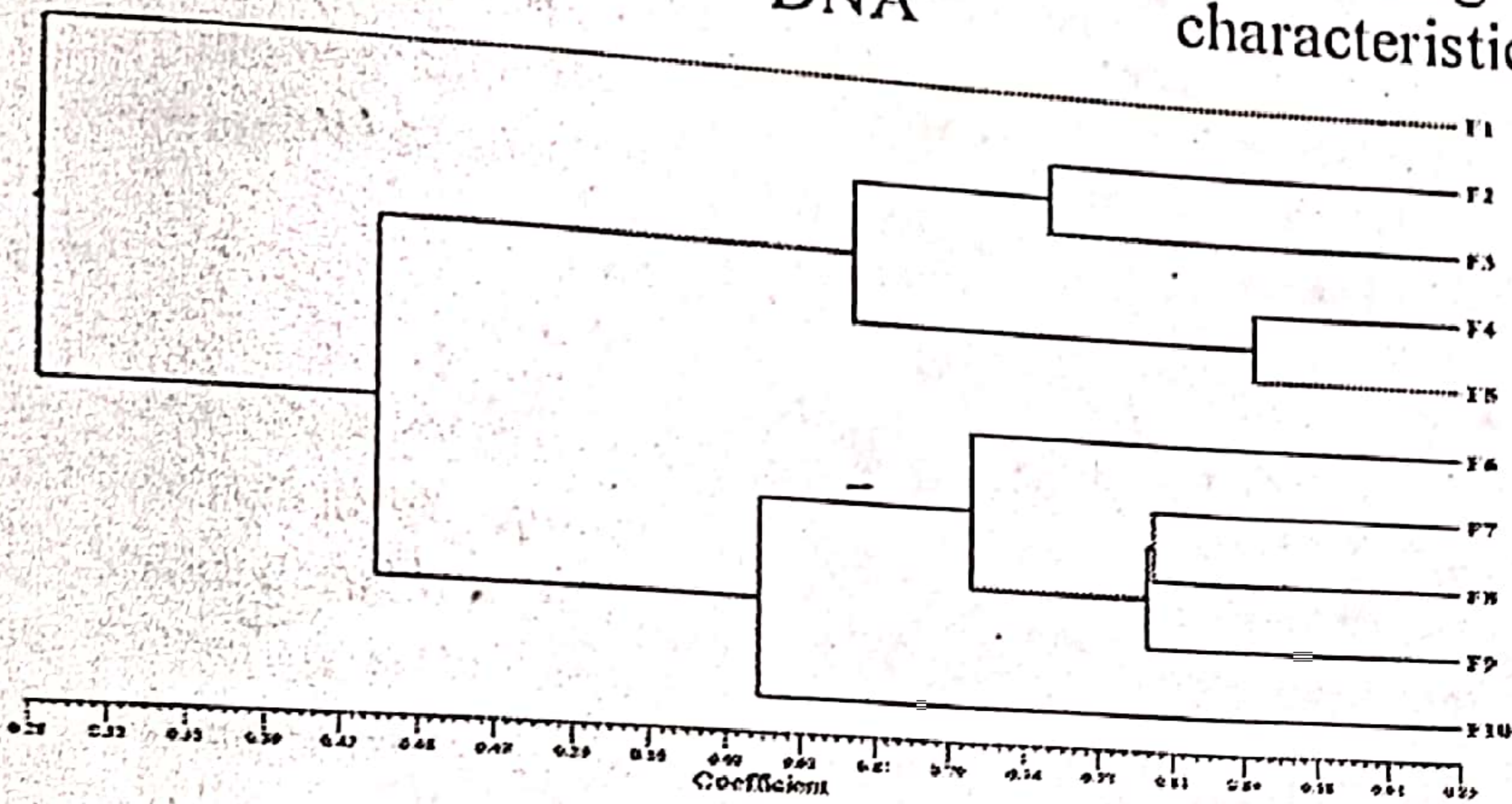


Figure 1 Dendrogram / Phylogenetic Tree

called a DNA profile, that is very likely to be different in unrelated individuals, thereby being as unique to individuals as are fingerprints (hence the alternative name for the technique). DNA profiling with the aim of identifying not an individual but a species is called DNA barcoding.

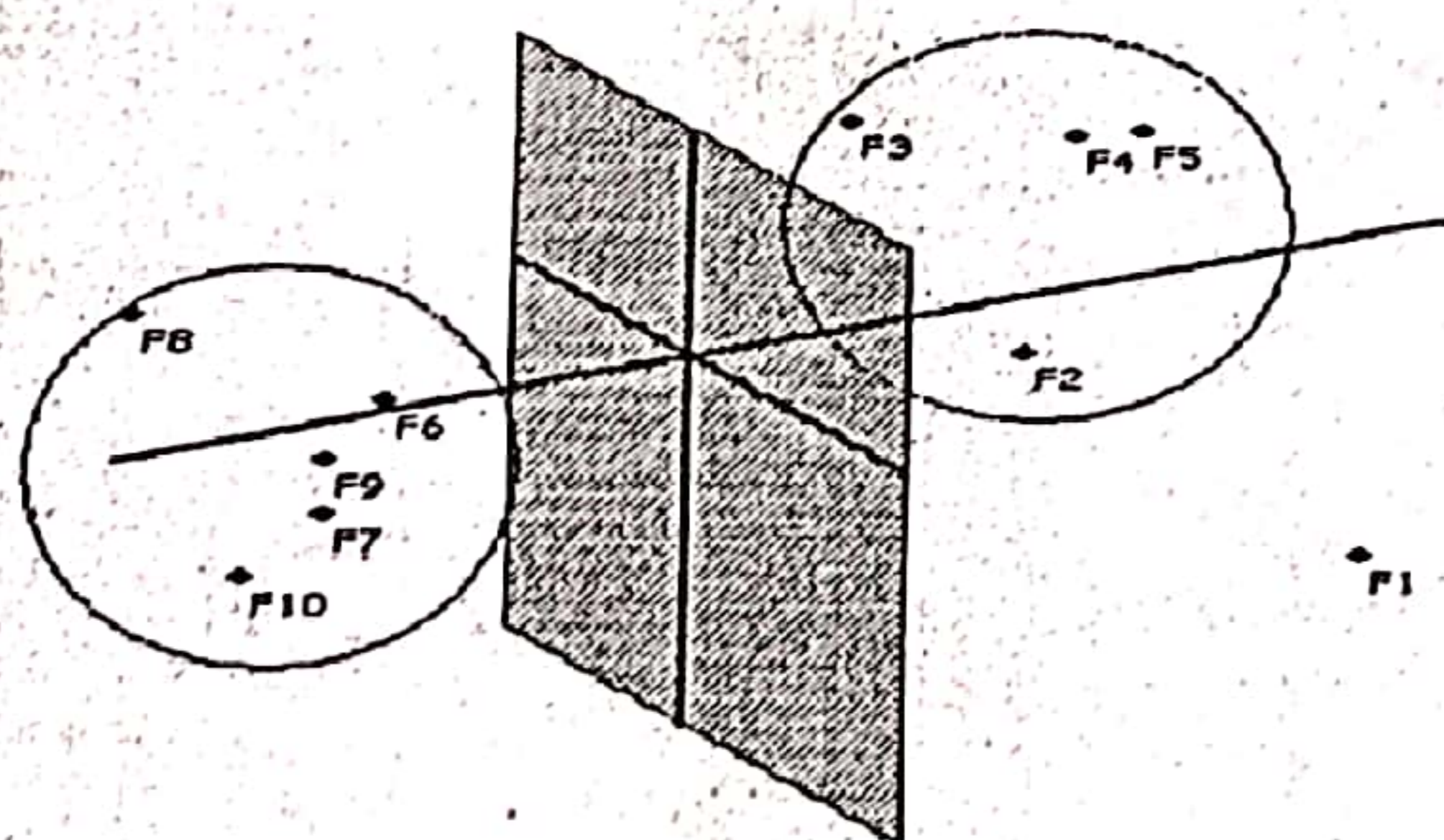


Figure 2. Principle Coordinate Analysis (PCA)

DNA profiling is most commonly used as a forensic technique in criminal investigations to identify an unidentified person or whose identity needs to be confirmed, or to place a person at a crime scene or to eliminate a person from consideration. DNA profiling has also been used to help clarify paternity, in immigration disputes, in parentage testing and in genealogical research or medical research. DNA fingerprinting has also been

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
F1	1.000									
F2	0.333	1.000								
F3	0.351	0.750	1.000							
F4	0.472	0.7333	0.638	1.000						
F5	0.444	0.689	0.567	0.848	1.000					
F6	0.105	0.366	0.411	0.275	0.282	1.000				
F7	0.230	0.500	0.542	0.390	0.365	0.642	1.000			
F8	0.190	0.566	0.435	0.439	0.380	0.600	0.800	1.000		
F9	0.230	0.516	0.542	0.461	0.365	0.642	0.793	0.800	1.000	
F10	0.195	0.500	0.571	0.450	0.390	0.566	0.766	0.718	0.656	1.000

Figure 3. Genetic (Jacacard's ) Similarity Coefficient

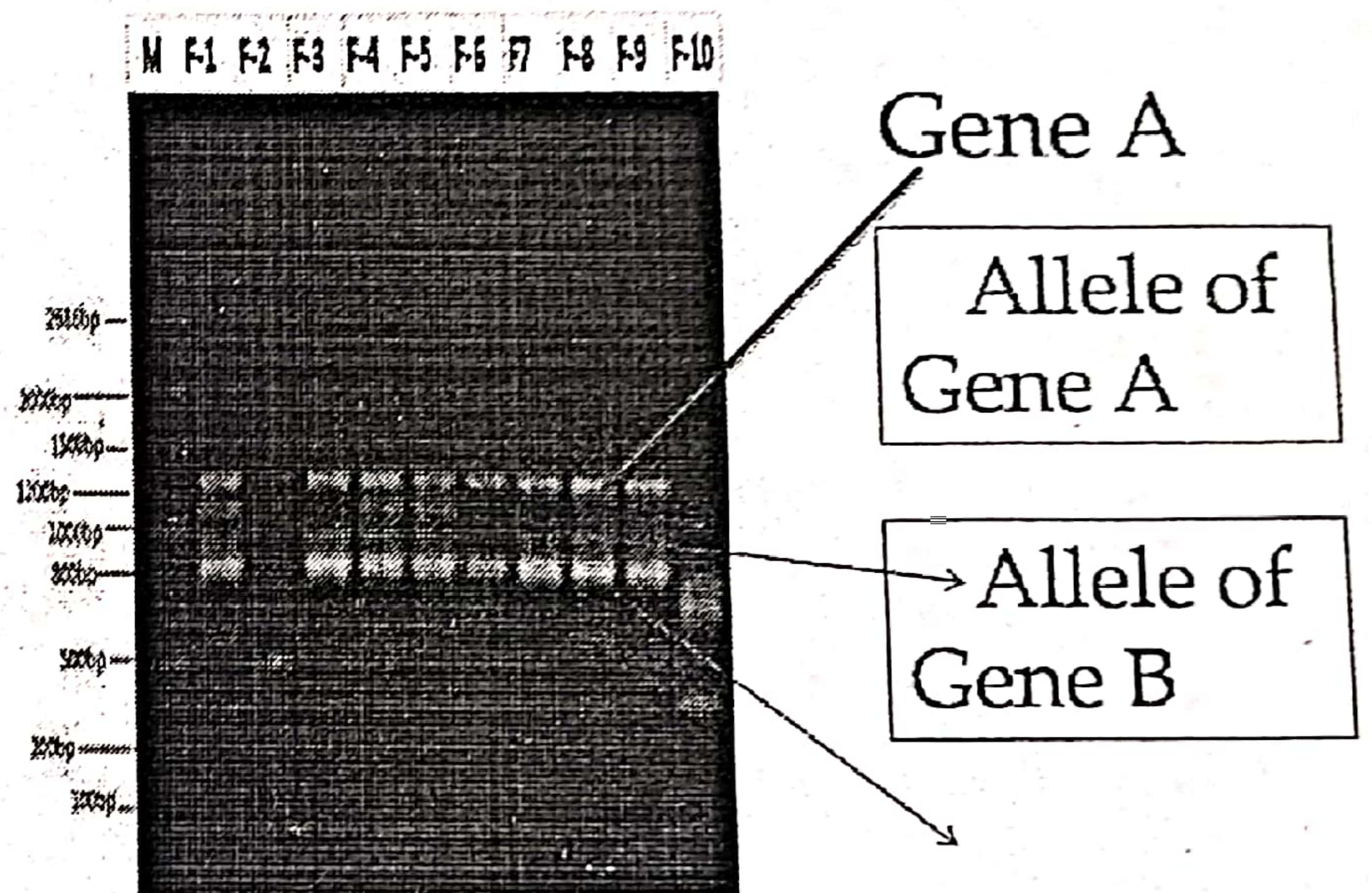


Figure 4. Gene and Allele Identification

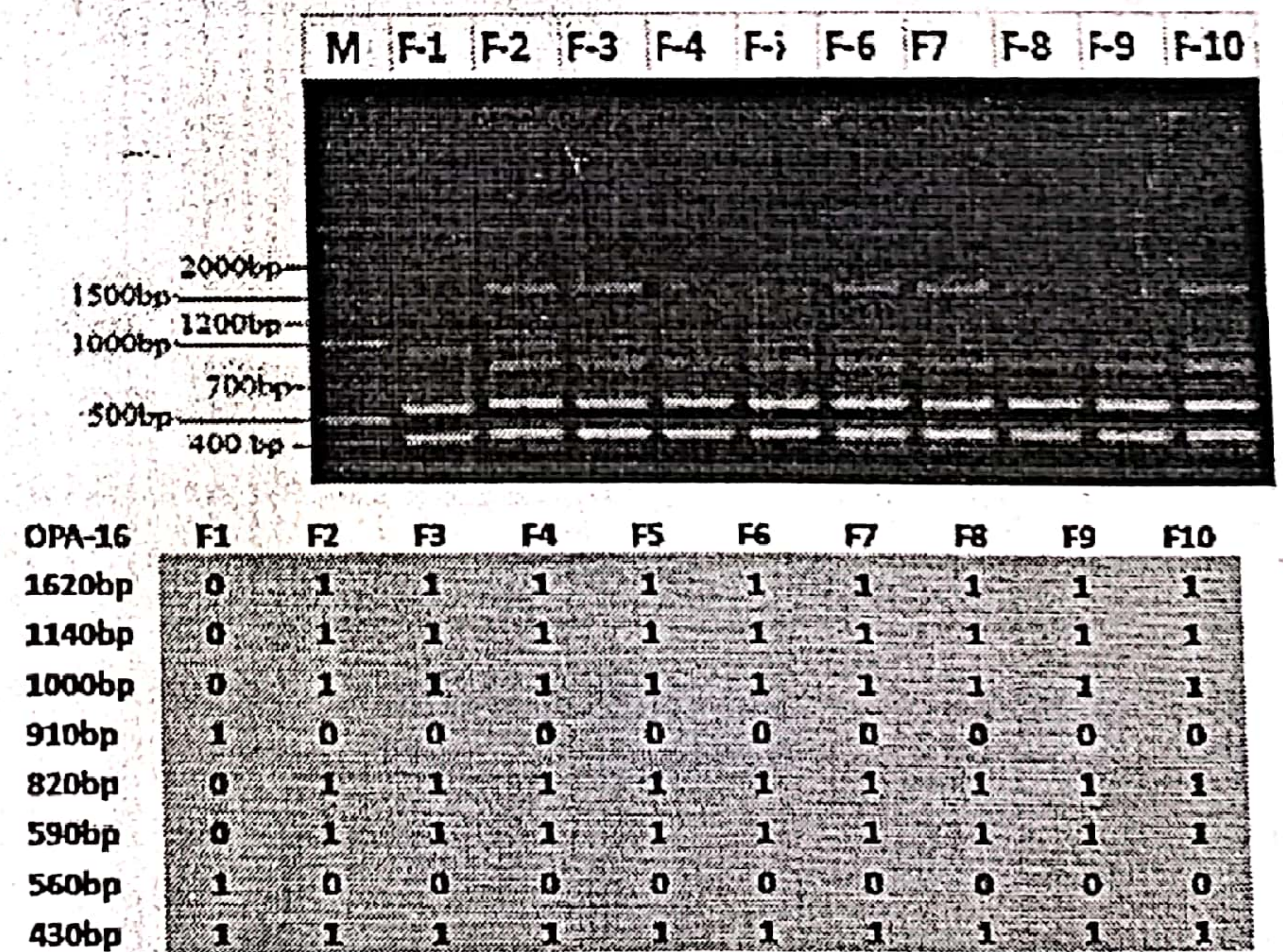
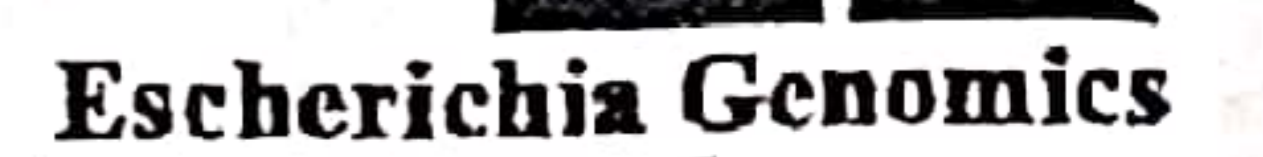


Figure 5. Banding Pattern (Profile Pattern)

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[Hello2dna@gmail.com](mailto>Hello2dna@gmail.com)



Youtube: [HelloDNA](https://www.youtube.com/channel/UC...) and Escherichia Genomics



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# REPORT ON THE WORKSHOP-ISOLATION OF DNA AND MOLECULAR TECHNIQUES

The Department of Biotechnology at S.M.H.S. Government College, Phase 6, Mohali, in partnership with Escherchia Genomic P. Ltd., proudly hosted a comprehensive 2 day workshop on DNA Isolation Technology & Molecular Biology Techniques. The event took place on 28-29 April, 2023 at Department of Biotechnology, offering an enriching experience for participants eager to delve into the exciting world of biotechnology and genomics.

## Workshop Highlights:

The workshop was meticulously designed to provide participants with practical expertise and an in-depth understanding of the following key aspects:

### Day 1: Practical Sessions

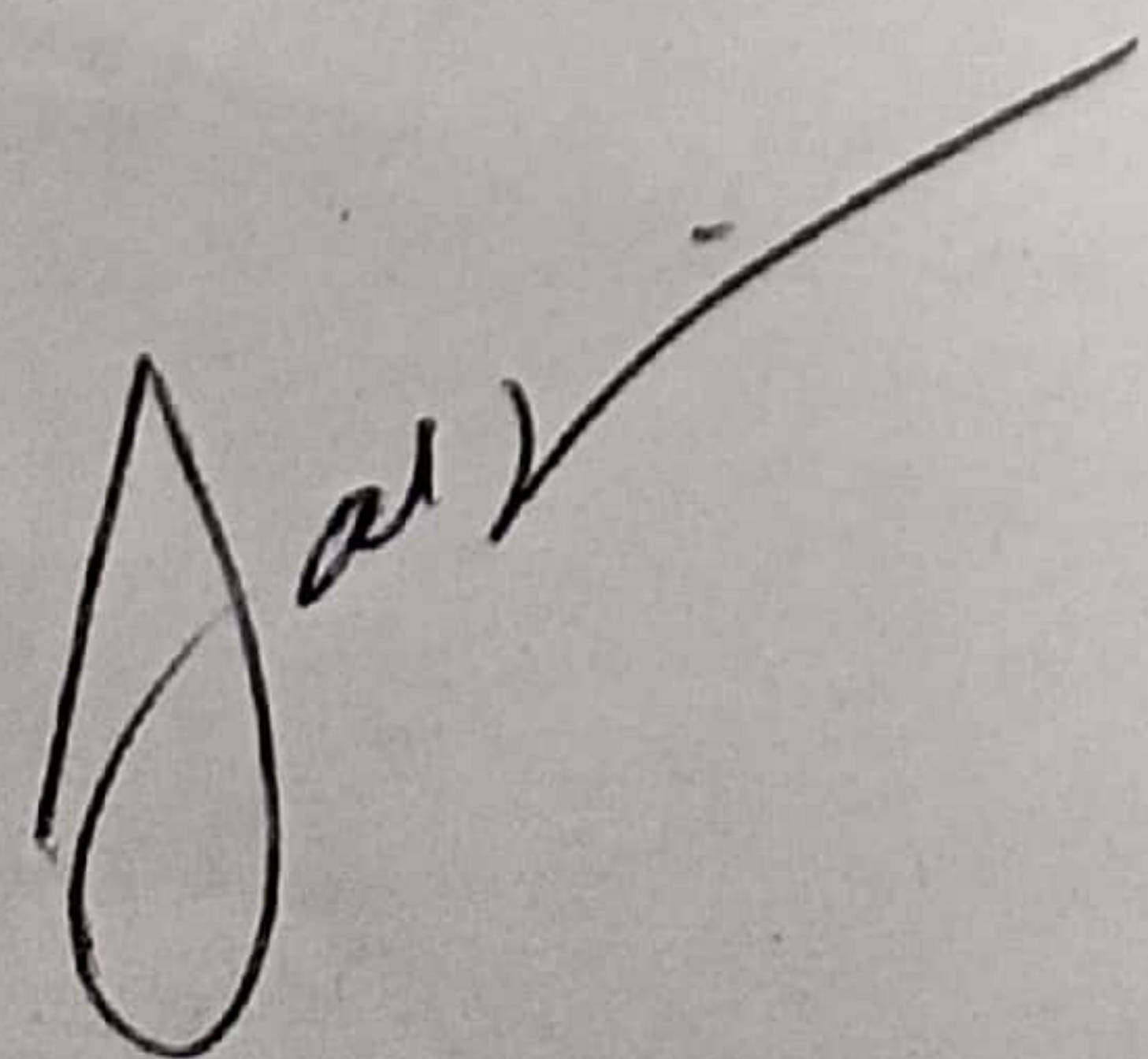
The workshop commenced on 28<sup>th</sup> April, 2023, focusing on hands-on practical sessions that allowed participants to gain valuable skills and insights. The day's highlights included:

- DNA Isolation Techniques: Participants were introduced to various methods and procedures for extracting DNA from diverse biological sources. They gained hands-on experience in the art of isolating DNA, an essential skill in the field of molecular biology.
- Molecular Biology Tools and Applications: Through interactive sessions and demonstrations, attendees explored the diverse tools and applications of molecular biology, including polymerase chain reaction (PCR), gel electrophoresis.

### Day 2: Practical + Lecture

On 29<sup>th</sup> April, 2023 the workshop continued with a combination of practical sessions and informative lectures, creating a well-rounded learning experience. The day's agenda featured:

- Laboratory Practices and Safety Protocols: Emphasis was placed on the importance of laboratory safety. Participants acquired knowledge about best practices for handling biological materials and chemicals, ensuring their well-being in a laboratory setting.



Harjeet Goyal

Principal  
SMHS Govt. College  
Ajit Singh Nagar



- Recent Advancements in Genomic Research: Esteemed experts from Escherchia Genomic P. Ltd. presented the latest advancements in genomic research. Participants had the privilege of gaining insights into cutting-edge technologies and their implications in genetics, medicine, and agriculture.

### Workshop Experience:

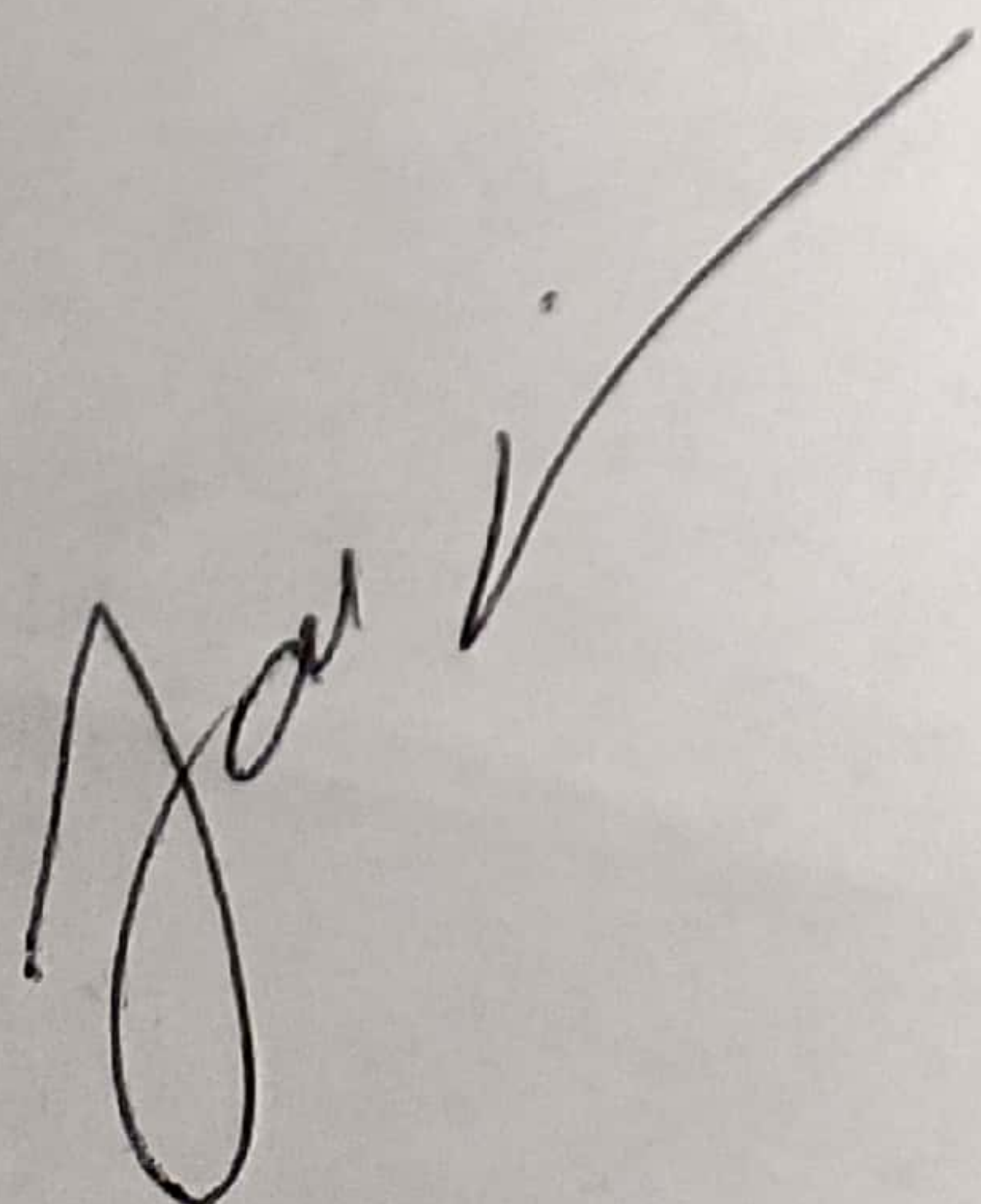
The workshop was a resounding success, with enthusiastic participation from students from diverse backgrounds. The sessions were a blend of informative lectures, interactive discussions, and hands-on laboratory work, creating a dynamic learning environment.

Participants were engaged in practical exercises, enabling them to master DNA isolation techniques and experiment with molecular biology tools. The guidance provided by industry experts enriched their understanding and competence in these critical areas.

### Certificates of Proficiency:

As promised, an evaluation test was conducted at the end of the workshop to assess participants' comprehension. We are pleased to report that all participants who successfully completed the workshop and passed the evaluation test received Certificates of Proficiency, a testament to their dedication and newfound skills.

The Department of Biotechnology at S.M.H.S. Government College, Phase 6, Mohali, extended its sincere gratitude to Escherchia Genomic P. Ltd. for their invaluable collaboration, and to all participants for their active engagement. We are confident that the knowledge and skills gained during this workshop will contribute significantly to the advancement of research and innovation in the field of biotechnology and genomics.



*Harjeet Anjral*

Principal  
SMHS Govt. College  
Sahibzada Ajit Singh Nagar



**WORKSHOP**  
**ISOLATION OF DNA AND MOLECULAR TECHNIQUES**

**Time: 48 hours**

**Total Marks: 50 Marks**

**Course Objectives:** This 2 day workshop aim to provide participants with a comprehensive understanding of DNA Isolation Technology and Molecular Biology Techniques, including hands-on experience in DNA extraction, molecular biology tools, laboratory safety, and insight into recent genomic research advancements, while fostering problem-solving skills and culminating in a Certificate of Proficiency for successful completion.

**Day 1: Practical Sessions:**

- Hands on training in DNA Isolation Techniques
- Molecular Biology Tools and Applications

**Day 2: Practical + Lecture Session**

- Laboratory Practices and Safety Protocols
- Recent Advancements in Genomic Research (Lecture)

**Course Learning Outcomes: On completion of the course:**

- Students will master diverse DNA isolation techniques,
- Practical application of molecular biology tools will empower students with hands-on proficiency.
- A commitment to laboratory safety protocols will be ingrained, ensuring responsible material handling and a secure working environment.
- A comprehensive understanding of recent genomic research advancements will equip students for innovative contributions in genetics, medicine, and agriculture.
- Students will build a robust knowledge foundation in DNA isolation and molecular biology techniques.

**Assessment procedure**

Assessment procedure for workshop is based on

1. 75% attendance will be mandatory.
2. There will be viva and written test

*Mandeep Kaur*  
HOD

Biotechnology Dept.

*Hajrat 47*  
Principal


SMHS Govt. college SAS Nagar



**SUGGESTED LABORATORY EXERCISES PERTAINING TO THEORY PAPERS: PLANT ECOLOGY AND PLANT UTILIZATION:**

Teachers may select plant/material available in their locality/institution.

1. To determine minimum number of quadrats required for study of a grassland.
2. To study the frequency of herbaceous species in grassland and to compare the frequency distribution with Raunkiaer's Standard Frequency Diagram.
3. To estimate Importance Value Index (IVI) for grassland species on the basis of relative frequency, relative density and relative biomass in protected and grazed grassland.
4. To measure the above ground plant biomass in a grassland.
5. To determine Kemp's constant for dicot and monocot leaves and to estimate the leaf area index of a grassland community.
6. To determine diversity indices (Richness, Simpson, Shannon Wiener) in grazed and protected grassland.
7. To estimate bulk density and porosity of grassland and woodland soil.
8. To determine moisture content and water holding capacity of grassland and woodland soil.
9. To study the vegetation structure through profile diagram.
10. To estimate transparency, pH and temperature of different water bodies.
11. To measure dissolved oxygen content in polluted and unpolluted water samples.
12. To estimate salinity of different water samples.
13. To determine the per cent leaf area injury of different leaf samples collected around polluted sites.
14. To demonstrate dust holding capacity of the leaves of different plant species.
15. Food Plants: Study of the morphology, structure and simple micro chemical tests of the food storing tissues in rice, wheat, maize, potato and sugarcane. Microscopic examination of starch in these plants (excepting sugarcane).
16. Fibres: Study of cotton flower, sectioning of the cotton ovules/developing seeds to trace the origin and development of cotton fibres. Microscopic study of cotton and test for cellulose. Sectioning and staining of jute stem showing the location and development of fibres. Microscopic structure. Tests for ligno-cellulose.
17. Vegetable Oils: study of hand sections of groundnut, mustard and coconut and staining of oil droplets with Sudan III and Sudan Black.
18. Field Visits: To study sources of firewood (10 plants), timber-yielding trees (10 trees) and bamboos. A list to be prepared mentioning special features.
19. Spices: Examine Black pepper, cloves, cinnamon (hand sections) and open fruits of cardamom and describe them briefly.
20. Preparation of an illustrated inventory of 10 medicinal plants and use their in indigenous systems of medicine of allopathy: Write their botanical and common names, parts used and diseases/disorders for which they are prescribed.
21. Beverages: Section of boiled coffee beans and tea leaves to study the characteristic structural features.

  
Harjeet Arjyal  
Principal  
SMHS Govt. College  
Sahibzada Ajit Singh Nagar



**BOTB3204T: PLANT UTILIZATION**

Max. Marks: 55 marks  
Pass Marks: 35% in Theory and Practical Separately  
Theory Paper: 40 marks  
Internal Assessment: 15 marks

Total Teaching hours: 45  
Time Allowed: 3 Hours

Objective of the paper is to impart knowledge to students about the plant resources useful to mankind.

**INSTRUCTIONS FOR THE PAPER SETTER**

The question paper will consist of three sections A, B and C. Section A and B will have four questions from the respective section of syllabus and will carry 6 marks each. Section C will consist of 8 short-answer type questions (8-10 lines) of 2 marks each which will cover the entire syllabus uniformly and will carry 16 marks in all.

**INSTRUCTIONS FOR CANDIDATES**

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

**SECTION-A**

1. The importance and nature of plant products; fibres: surface fibres (cotton), soft fibres (Jute), hard fibres (Coir). Forest products: Wood, properties, seasoning and importance, important timber plants of India.
2. Brief history of origin of food plants; cultivation practice and recommended varieties of wheat, rice, maize and sugarcane with particular reference to Punjab.
3. Cultivation practices and use of soyabean, sunflower, mustard, groundnut and coconut.
4. Vegetables and Fruits: Botanical name, family, season and area of cultivation of potato, tomato, brinjal, carrot, ladyfinger, pea, mango, apple, banana, guava, kinnow and grapes.

**SECTION-B**

5. Spices: General account pertaining to botanical name, family and part used in case of clove, cardamom, black pepper, turmeric, cumin and ginger.
6. Medicinal Plants: General account pertaining to botanical name, family, part used and active principle in case of belladonna, neem, tulsi, stevia, rauwolfia, ashwagandha and glycyrrhiza.
7. Beverages and Narcotics: Cultivation practices, botanical name, family and active ingredients of tea and coffee. Cannabis, tobacco and opium.
8. Rubber: Major sources, cultivation, processing and uses of Para rubber.

**RECOMMENDED READINGS**

1. Kochhar, S.I., 1998, *Economic Botany in Tropics*, 2<sup>nd</sup> Edition, Mac Millan India Ltd., New Delhi.
2. Sambamurthy, A.V.S.S. and Subramanyam, N.S. 1989, *A Textbook of Economic Botany*, Wiley Eastern Ltd., New Delhi.
3. Sharma, O.P. 1996, *Hill's Economic Botany* (Late Dr. A.F. Hill, adapted by O.P. Sharma) Tata McGraw Hill Co. Ltd., New Delhi.
4. Simpson, B.B. and Conner, M. 1986, *Economic Botany - Plants in Our World*, McGraw Hill, New York.

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Principal  
SMHS Govt. College  
Sahibzada Ajit Singh Nagar





Ref. No. 159/HATSGCM

Dated 13/06/23

**DIPLOMA IN FOOD PRODUCTION**

**FIELD WORK REPORT (SESSION 2022-2023)**

This to certify that total 32 Students of Diploma in Food Production Session 2022-2023 are undertaking Mandatory six-month Industrial Training. Details of the Organization in which students are selected for Industrial Training is given below.

NAME OF THE HOTEL	PROJECT WORK	PLACE OF FIELD WORK	TOTAL NO OF STUDENTS	DURATION	PROJECT WORK COMPLETION
Country Inn & Suites	Industrial Training	Gurgaon (Haryana)	25	Six Month	On going
Hotel Combermere	Industrial Training	Shimla (Himanchal Pardesh)	07	Six Month	On going

The Emails offering the students opportunity for undertaking Industrial Training is also attached.

H.O.D.

Secretary

Principal  
SMHS Govt. College  
Salibzada Ajit Singh Nagar



ishwar chauhan <ishwarchauhan2006@rediffmail.com>

Thursday June 15,  
2023 20:23 PM

to me

Dear Sir/Madam,  
Greetings from Comber mere !!!!!

Industrial training confirmation letter

Thanks for mail & grateful & appreciate your decision to send your students to our organisation for Industrial training period for six-month F&B Production departments.

Our organisation has well qualified & well experienced Supervisors/Tr. Manager who will groom your students.

Selected candidates

1. Tushar Sharma
2. istkar
3. Jashanpreet singh
4. khusboo singh
5. Amandeep singh
6. lovish
7. veerpal kaur

Hotel will provide students accommodation (Bedding they have to arrange)

Sanitized  
ghant

Principal  
SMHS Govt. College  
Sahibzada Ajit Singh Nagar



Harpreet Kaur <hrmanager@cisnh8gurgaon.in>

to me, Poonam

Thursday 15 2023  
5:15 PM

Dear Mr. Johny Kumar Broca

Namaskar

With reference to the interest shown by your students for industrial training of 6 month with us we hereby confirm their industrial training with us from 1<sup>st</sup> August 2023 onwards

Selected students

SR NO	NAME
1	Bandana
2	Evjot Kaur
3	Gurpreet Singh
4	Jora Singh
5	Mukul
6	Naresh
7	Veerbal
8	Parwinder Singh
9	Deepak
10	Gurjeet Singh
11	Manpreet Kaur
12	Jaskirat Singh
13	Sandeep Singh
14	Ashish Kumar
15	Babbu Ram
16	Mohit
17	Vikee
18	Davinder
19	Davinder Singh
20	Kuldeep Singh
21	Amanpreet Singh
22	Harsdeep Singh
23	Akash Bose
24	Abhinav
25	Balsidak Singh

The Hotel will provide students accommodation & Rs 3000/- per month Stipend and will be entitled for duty meals and laundry facility. Please find the Confirmation letter and Annexure for the same.

Request you to acknowledge the same and send us the NOC

Regards

Harpreet Kaur • Human Resources Manager

Country Inn & Suites By Carlson Gurgaon, Udyog Vihar

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c: +91 7838 660030 e: hrmanager@cisnh8gurgaon.in

Adjacent to Plot No 406, Udyog Vihar Phase - III, Gurgaon 122016,  
India

Varinder  
Ghans

Principal  
S.P.S. Govt. College  
Sambhal - A.J.L. Singh Nagar



**SCHEME OF STUDIES**

**SEMESTER V**

**Paper: Food Science & Child Development-I**

Theory : 6 Periods/week

Practical : 6 Periods/week

Scheme of Examinations						
	Name of Paper	No. of Paper	Time in Hr	Marks	Internal Assessment Marks	Total
Theory	Food Science & Child Development -I	1	3	44	16	60
Practical	Food Science & Child Development-I	1	3	40	-	40
Total Marks (Theory & Practical)						100

Note: Internal Assessment will be based on attendance (4 Marks), Written Assignments/Project Work (7 Marks) and two mid-semester tests\* (7 Marks).

\* Average of both mid semester tests.

**SEMESTER VI**

**Paper: Food Science & Child Development-II**

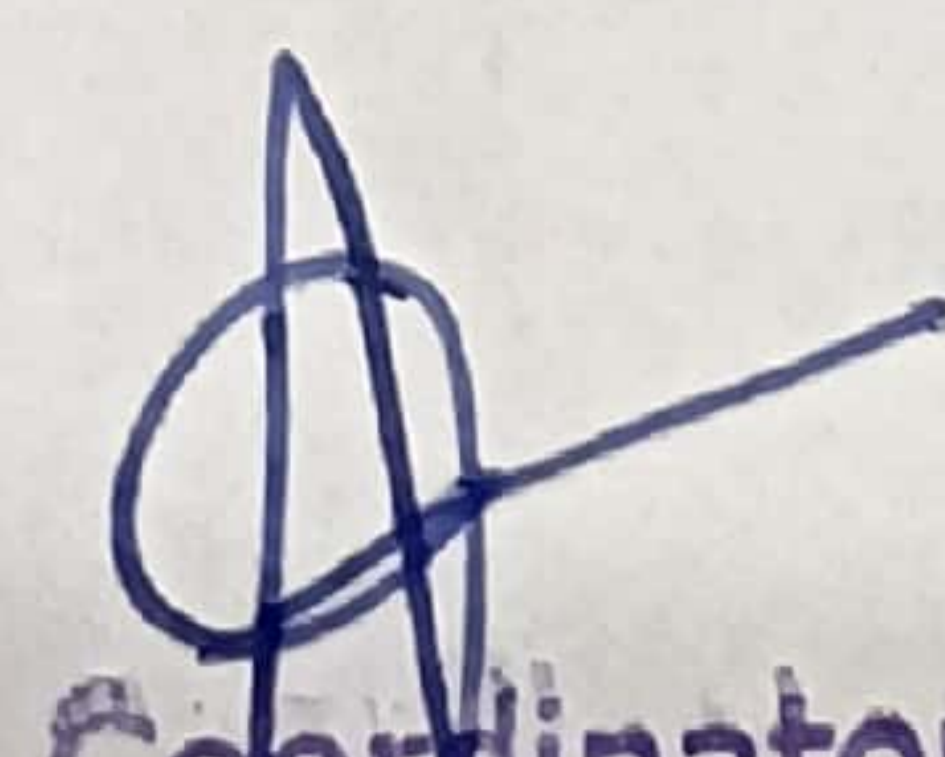
Theory: 6 Periods/week

Practical: 6 Periods/week

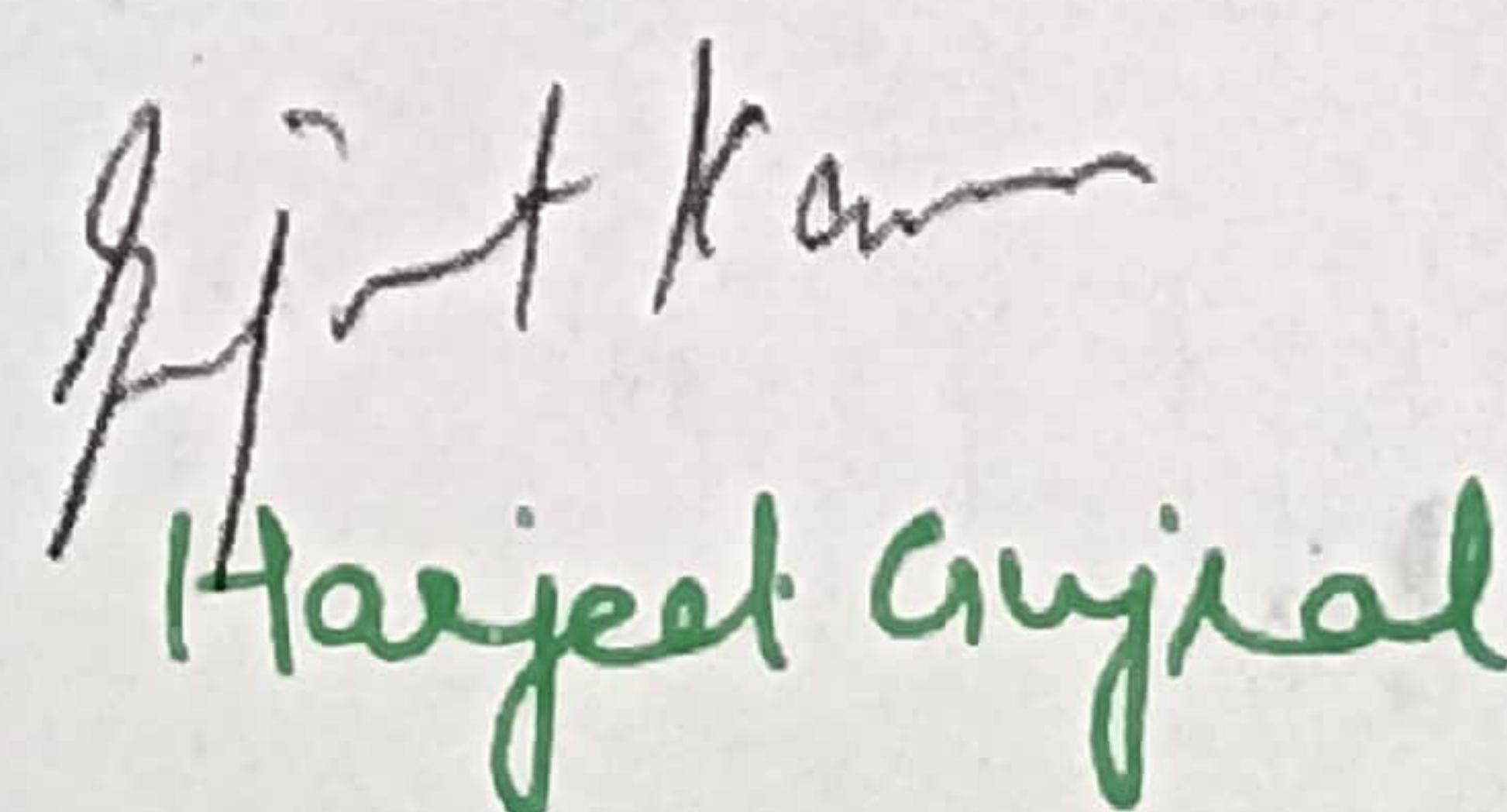
Scheme of Examinations						
	Name of Paper	No. of Paper	Time in Hr	Marks	Internal Assessment Marks	Total
Theory	Food Science & Child Development -II	1	3	44	16	60
Practical	Food Science & Child Development -II	1	3	40	-	40
Total Marks (Theory & Practical)						100

Note: Internal Assessment will be based on attendance (3 Marks), Written Assignments/Project Work (6 Marks) and two mid-semester tests\* (7 Marks).

\* Average of both mid semester tests.



Coordinator  
NAAC  
SMHS Government College  
Sahibzada Ajit Singh Nagar



Principal,  
SMHPSSCV, Govt. College,  
Sahibzada Ajit Singh Nagar.



**SEMESTER V**

**Theory Paper: Food Science & Child Development-I**

Maximum Marks: 60  
Theory: 44  
Internal Assessment: 16

Time allotted: 3 Hrs  
Periods per week : 6  
Pass Marks: 35% in  
theory and practical separately

**INSTRUCTIONS FOR THE PAPER-SETTER**

The question paper will consist of three sections A, B and C. Sections A and B will have four questions from the respective sections of the syllabus and will carry 6½ marks each. Section C will consist of 9 short answer type questions of 2 marks each which will cover the entire syllabus uniformly.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions each from Section A and B of the question paper and the entire section C.

**SECTION-A**

1. Importance and functions of food, Study of basic food groups.
2. Essential food constituents: Carbohydrate, Proteins and Fats; Functions, Source and requirements and deficiency.
3. Source and deficiency, functions, requirements and excess of: Vitamins: A, B complex, C, D, E and K, Minerals: Ca, P, Na, Fe, K, I.
4. Methods of cooking, reasons for cooking food-cooking methods by moist heat, dry heat, by fat, microwave cooking.

**SECTION-B**

5. Definition, importance and objectives of child development.
6. The physical and motor development of the child and factors affecting the same. Language development and factors affecting language development.
7. Emotional development: Characteristics of childhood emotions  
Common Emotions: fear, anger, joy, jealousy, anxiety, curiosity, etc. and factors affecting the emotional development.
8. Social development-during infancy, babyhood, childhood, and adolescence, the role of family and school in the process of socialization.

**Books recommended:**

1. Randhawa, R. K., Nutrition and Child Development, Pradeep Pub, Jalandhar.
2. Gopalan, C, Balasubramaniam, S.C. 1980. Nutritive Value of Indian Foods", NIN, Indian Council of Medical Research, Hyderabad.
3. ICMR 1980. Recommended Dietary Allowances for Indians", ICMR, New Delhi.
4. ICMR 1990: " Recommended Dietary Intake for Indians", ICMR, New Delhi.
5. Patvardhan V.N., " Nutrition in India".
6. Rajalakshmi 1969, "Applied Nutrition".
7. Wilson, Eva. D, 1979 Principles of Nutrition
8. Gupta, S., Garg, A., Aggarwal, A, Kaur, J. 2016. "Textbook of Foods & Nutrition & Child Development". Kalyani Publishers.



SEMESTER V

Practical Paper: Food Science & Child Development-I

Maximum Marks : 40  
Pass Marks: 35%

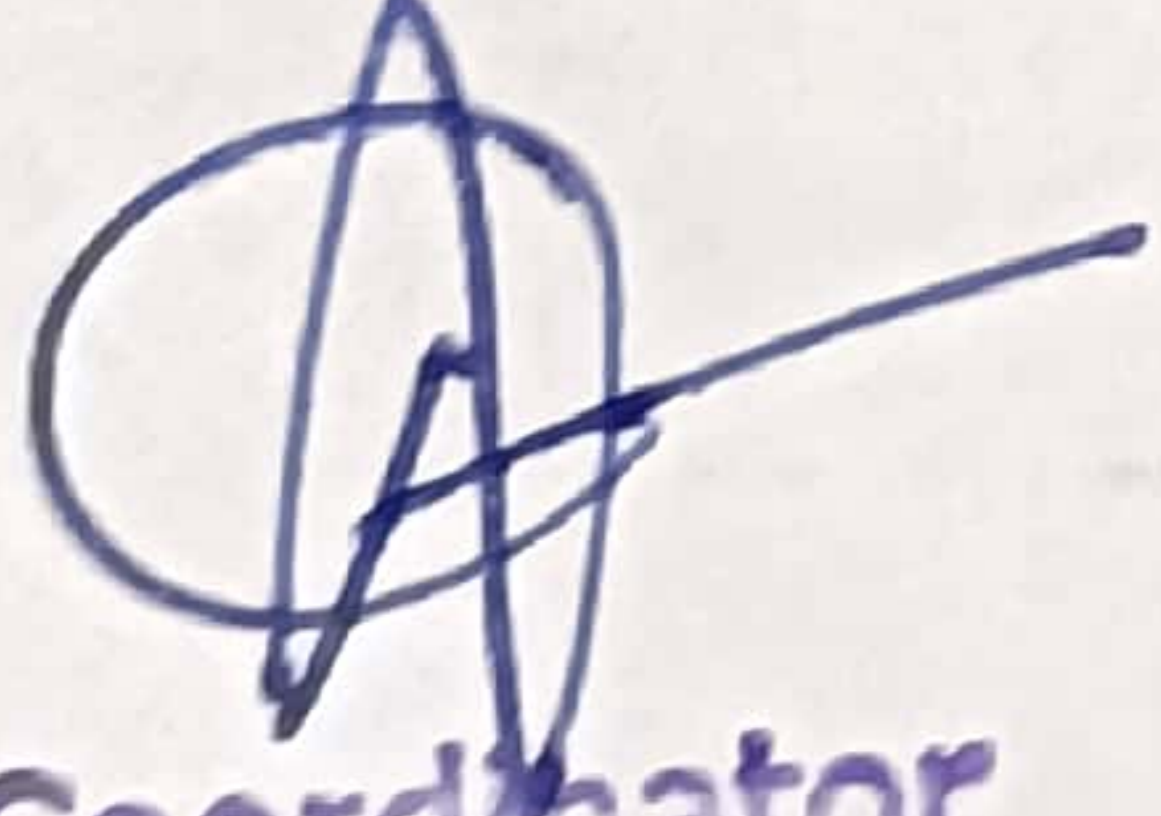
Time allotted : 3 Hours  
Periods per week: 6

1. Preparation of minimum five dishes by using various methods of cooking - boiling, steaming, baking), frying (deep and shallow) and roasting with different food groups (cereals, pulses and vegetable groups).
2. Hot and cold beverages (two each).
3. Food preservation: pickles, chutneys, jams, squashes, (two each).
4. Preparation of scrap book showing different stages of development ( physical, motor, emotional and social).

PROJECT WORK - (BA-II)

Harjeet Goyal

Principal,  
SMHS Govt. College,  
Sahibzada Ajit Singh Nagar.

  
Coordinator  
NAAC  
SMHS Government College  
Sahibzada Ajit Singh Nagar



**SEMESTER VI**

**Theory Paper: Food Science & Child Development -II**

Maximum Marks: 60  
Theory: 44  
Internal Assessment: 16

Time allotted : 3 Hours  
Periods per week : 6  
Pass Marks : 35% in theory  
and practical separately

**INSTRUCTIONS FOR THE PAPER-SETTER**

The question paper will consist of three sections A, B and C. Sections A and B will have four questions from the respective sections of the syllabus and will carry 6½ marks each. Section C will consist of 9 short answer type questions of 2 marks each which will cover the entire syllabus uniformly.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions each from Section A and B of the question paper and the entire section C.

**SECTION-A**

1. Balanced diet: Definition, points to be considered while planning balanced diets.
2. (a) Meal planning: Definition, importance and factors affecting meal planning.  
(b) Planning of meals for different age groups i.e. pre-school, adult (male & female), pregnancy & lactation.
3. (a) Normal diet and its modifications. (b) Definition of soft, bland and liquid diets with examples.
4. Dietary requirement during typhoid fever, digestive disorders (constipation, diarrhea and dysentery), diabetes, high blood pressure.

**SECTION-B**

5. Prenatal Development- Definition, importance of parental period for the mother and the child, Meaning of fertilization, Stages of prenatal development - ovum, embryo and foetus. Factors affecting prenatal development.
6. Physical changes and discomforts during the pregnancy, Physical and psychological care during pregnancy.
7. (i) Feeding of the infant: (a) Breast feeding (b) Bottle feeding (c) Weaning – Different kinds of important weaning foods for infants.  
(ii) Behavioral problems in children- thumb sucking, stealing, nail biting (their causes & remedies).
8. Digestive disturbances-diarrhea, constipation, vomiting and colic.  
Viral infection - Viral fever, flu, (symptoms and preventive measures).

**Books recommended:**

1. Davidson, S. Passmore, R. Brock, J.F. and Trusweld, A.S. 1975 "Human Nutrition and Dietaries". English Language Book Society and Churchill Livingstone.
2. FAO, 1974: " Handbook of Human Nutritional Requirements" FAO series.
3. Gopalan, C, Balasubramaniam, S.C. 1980 " Nutritive Value of Indian Foods", NIN, Indian Council of Medical Research, Hyderabad.
4. ICMR 1980: " Recommended Dietary Allowances for Indians", ICMR, New Delhi.
5. ICMR 1990: " Recommended Dietary Intake for Indians", ICMR
6. Patvardhan V.N., " Nutrition in India".
7. Wilson, Eva. D, 1979 Principles of Nutrition
8. Gupta, S. , Garg, A., Aggarwal, A, Kaur, J. 2016 "Textbook of Foods & Nutrition & Child Development". Kalyani Publishers