



# MAHISHADAL RAJ COLLEGE

(Govt. Sponsored)

NAAC Accredited 'A' Grade College

DST (FIST) Govt. Of India approved College, NSDC Training Partner

Estd. : 1946

Mahishadal : Purba Medinipur

Phone STD 03224 No. 240220

Ref. No.....

**Date:**

## **ADD ON COURSE 2019-20**

**Organised by Department Zoology & Physiology**

**Topic: Gel electrophoresis**

**Add on course summary:**

### **REPORT:**

**Name of the course-** Gel electrophoresis

**Course coordinator:** *Dr. Subhamoy Das*, (Associate Professor, HOD, Department of Zoology , Mahishadal Raj College)

**Date of commencement:** 03.02.2020

**Date of completion:** - 19.02.2020

**Number of participant enrolled:** 30

**Total duration day:** 15

**Total duration hour:** 30

**Evaluation method:-** Paper pen MCQ and practical work

### **RESULT DETAILS:-**

**Number of student participate in this program:** 30

**Number of student completes this program:** 27

**Number of student got certificate in this program:** 27

**Name of the course:** Gel electrophoresis

**Course coordinator:** *Dr. Subhamoy Das*, (Associate Professor, HOD, Department of Zoology , Mahishadal Raj College)



## Gel electrophoresis

### About the course:

Gel electrophoresis is a laboratory technique used in molecular biology and biochemistry to separate and analyze macromolecules such as DNA, RNA, or proteins based on their size and charge. It is a fundamental tool for various applications, including DNA profiling, gene expression analysis, and protein characterization. Courses on gel electrophoresis may be part of broader molecular biology, biochemistry, or biotechnology curricula, and they often involve a combination of theoretical lectures, hands-on laboratory experiments, and data analysis sessions. Practical experience is crucial for mastering gel electrophoresis techniques.

### Learning outcomes:

Completing a course on gel electrophoresis can open up various job opportunities in the fields of molecular biology, genetics, biotechnology, and biochemistry. This course opens up various job opportunities in both the public and private sectors. The potential job opportunities of this course are research assistant or technician, biomedical scientist, biotechnologist, quality control analyst, forensic scientist, academic research, pharmaceuticals research associate, biological data analyst, clinical research coordinator, environmental scientist and laboratory manager.

### Target audience:

Any branch of life sciences students (UG and PG), research scholars, and faculties.

### Course content overview:

This course introduces the basic idea about Gel Electrophoresis Technique. Gel electrophoresis is a laboratory method used to separate mixtures of DNA, RNA, or proteins according to molecular size. In gel electrophoresis, the molecules to be separated are pushed by an electrical field through a gel that contains small pores. The molecules travel through the pores in the gel at a speed that is inversely related to their lengths. This means that a small DNA molecule will travel a greater distance through the gel than will a larger DNA molecule.

As gel electrophoresis involves an electrical field; in particular, this field is applied such that one end of the gel has a positive charge and the other end has a negative charge. Because DNA and RNA are negatively charged molecules, they will be pulled toward the positively charged end of the gel. Proteins, however, are not negatively charged; thus, when researchers want to separate proteins using gel electrophoresis, they must first mix the proteins with a detergent called sodium dodecyl sulfate. This treatment makes the proteins unfold into a linear shape and coats them with a negative charge, which allows them to migrate toward the positive end of the gel and be separated. Finally, after the DNA, RNA, or protein molecules have been separated using gel electrophoresis, bands representing molecules of different sizes can be detected.



✚ **Schedule:** Total 30 hours

DAY	SCHEDULE
Day 1	Introduction to molecular biology technique (T) (2 hours)
Day 2	Gel electrophoresis (T) (2 hours)
Day 3	Agarose gel electrophoresis for DNA (T+P) (2 hours)
Day 4	DNA sample preparation (T+P) (2 hours)
Day 5	Sample loading and gel run (T+P) (2 hours)
Day 6	Visualization and results interpretation (T+P) (2 hours)
Day 7	Agarose gel electrophoresis for RNA and sample preparation (T+P) (2 hours)
Day 8	RNA sample loading, gel run, visualization and data interpretation. (T+P) (2 hours)
Day 9	SDS PAGE (T) (2 hours)
Day 10	Sample preparation for SDS PAGE (T+P) (2 hours)
Day 11	Protein sample load and gel run (2 hours)
Day 12	Visualization of band and data interpretation. (2 hours)
Day 13	Native PAGE and Sample preparation. (2 hours)
Day 14	Gel run, visualization, and data interpretation. (2 hours)
Day 15	Doubts clear and revision

✚ **Detail Work Schedule**

Date	Day	Contents	Time	Duration	Experts	Designation
03.02.20	1	Orientation & Introduction to molecular biology technique (T)	12 to 2pm	2	Dr. Subhamoy Das	HOD DEP. of ZOOLOGY
04.02.20	2	Gel electrophoresis (T)	1 to 3 pm	2	Dr. Rajkumar Guchhait	SACT Mahishadal Raj College
05.02.20	3	Agarose gel electrophoresis for DNA (T+P)	3 to 5pm	2	Dr. Rajkumar Guchhait	SACT Mahishadal Raj College
06.02.20	4	DNA sample preparation (T+P)	03 to 05pm	2	Dr. Rajkumar Guchhait	SACT Mahishadal Raj College
07.02.20	5	Sample loading and gel run (T+P)	02 to 04pm	2	Dr. Rajkumar Guchhait	SACT Mahishadal Raj College
08.02.20	6	Visualization and results interpretation (T+P)	01 to 03pm	2	Dr Rajkumar Guchhait	SACT Mahishadal Raj College
10.02.20	7	Agarose gel electrophoresis for RNA and sample preparation (T+P)	03 to 05pm	2	Prof. Sagnik Mandal	SACT Mahishadal Raj College
11.02.20	8	RNA sample loading, gel run, visualization and data interpretation. (T+P)	02 to 04pm	2	Prof. Sagnik Mandal	SACT Mahishadal Raj College



12.02.20	9	SDS PAGE (T)	02 to 04pm	2	Prof. Manik Das	SACT Mahishadal Raj College
13.02.20	10	Sample preparation for SDS PAGE (T+P)	01 to 03pm	2	Prof. Manik Das	SACT Mahishadal Raj College
14.02.20	11	Protein sample load and gel run	02 to 04pm	2	Prof. Manik Das	SACT Mahishadal Raj College
15.02.20	12	Visualization of band and data interpretation.	02 to 04pm	2	Prof. Manik Das	SACT Mahishadal Raj College
17.02.20	13	Native PAGE and Sample preparation.	01 to 03pm	2	Prof. Moumita Jana	SACT Mahishadal Raj College
18.02.20	14	Gel run, visualization, and data interpretation. Doubts clear and revision	01 to 03pm	2	Prof. Moumita Jana	SACT Mahishadal Raj College
19.02.20	15	Evaluation, valediction, feedback	12 to 2 pm	2	Dr. Subhamoy Day, Dr. Rajkumar Guchhait, Prof. Sagnik Manadal, Prof. Manik Das and Prof. Moumita Jana. DR.Asim Kr Bera	HOD & SACT., Zoology; Principal, MRC
				30 hours		

**✚ Course structure and examination scheme:**

Course name	Theory classes (hr.)	Practical classes (hr.)	Internal marks	External marks		Total marks
				Theory	Practical	
Gel electrophoresis	7	23	20	40	40	100



Participant's Details and attendance:

Enrolment Details of Students

Sl. No.	Student ID	Roll No.	Name
1.	B.Sc/17/0073	2170073	RITESH PAIK
2	B.Sc/17/0074	2170074	MAHITOSH KAR
3	B.Sc/17/0076	2170076	SUPRIYA MAITY
4	B.Sc/17/0077	2170077	SUDEEP PRADHAN
5	B.Sc/17/0083	2170083	KRISHNENDU DAS
6	B.Sc/17/0084	2170084	MIRJA TAHID HASAN
7	B.Sc/17/0085	2170085	SOUMYAJIT HAIT
8	B.Sc/17/0090	2170090	SOMASHREE DOLAI
9	B.Sc/17/0092	2170092	UDAY CHAKRABORTY
10	B.Sc/17/0093	2170093	BISWAJIT RANA
11	B.Sc/17/0094	2170094	NABAKUMAR DAS
12	B.Sc/17/0095	2170095	SAJAL KUMAR BHARASA
13	B.Sc/17/0100	2170100	SUTAPA BHOWMIK
14	B.Sc/17/0101	2170101	KRISHNENDU MAJI
15	B.Sc/17/0102	2170102	UTTAMITA DAS
16	B.Sc/17/0104	2170104	MOUMITA PRADHAN
17	B.Sc/17/0106	2170106	BIKASH DASH
18	B.Sc/17/0107	2170107	BUDDHADEV MONDAL
19	B.Sc/17/0109	2170109	SATTWIK SANA
20	B.Sc/17/0112	2170112	Arpita Bhowmik
21	B.Sc/17/0115	2170115	SUKAMAL MAJI
22	B.Sc/17/0116	2170116	SOMA SAMANTA
23	B.Sc/17/0117	2170117	TANMAY DAS
24	B.Sc/17/0118	2170118	SANDIP BARMAN
25	B.Sc/17/0119	2170119	BIBHAS GAYEN
26	B.Sc/17/0122	2170122	ANUPAM BHUNIA
27	B.Sc/17/0128	2170128	APSANA KHATUN
28	B.Sc/17/0129	2170129	BASUDEB NAYEK
29	B.Sc/17/0130	2170130	FAYZAL ALAM MOLLA
30	B.Sc/17/0131	2170131	ANIRUDDHA MAITY



## Sample Question of Examination

**ADD ON COURSE**  
**Department of Zoology, Mahishadal Raj College**  
**Gel Electrophoresis**

**Full Marks: 50**

**Time: 2 Hrs**

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*The figures in the right-hand margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable.  
Illustrate the answers wherever necessary.*

**A. Answer the following MCQ type questions: 1x10=10**

1. In an SDS-PAGE
  - a. proteins are denatured by the SDS
  - b. proteins have the same charge-to-mass ratio
  - c. smaller proteins migrate more rapidly through the gel
  - d. all of the above
  
2. Proteins can be visualized directly in gels by
  - a. staining them with the dye
  - b. using electron microscope only
  - c. measuring their molecular weight
  - d. none of these
  
3. In SDS-PAGE, the protein sample is first
  - a. treated with a reducing agent and then with anionic detergent followed by fractionation by electrophoresis
  - b. fractionated by electrophoresis then treated with an oxidizing agent followed by anionic detergent.
  - c. treated with a oxidizing agent and then with anionic detergent followed by fractionation by electrophoresis
  - d. none of the above
  
4. Electrophoresis of histones and myoglobin under non-denaturing conditions (pH = 7.0) results in
  - a. both proteins migrate to the anode
  - b. histones migrate to the anode and myoglobin migrates to the cathode
  - c. histones migrate to the cathode and myoglobin migrates to the anode
  - d. both proteins migrate to the cathode
  
5. In isoelectric focusing, proteins are separated on the basis of their
  - a. relative content of positively charged residue only
  - b. relative content of negatively charged residue only
  - c. size
  - d. relative content of positively and negatively charged residue
  
6. Proteins are separated in an SDS-PAGE experiment on the basis of their
  - a. positively charged side chains
  - b. molecular weight
  - c. negatively charged side chains
  - d. different isoelectric points
  
7. The subunit molecular weight as well as the number of subunits in the quaternary structure can be determined by
  - a. SDS-PAGE electrophoresis
  - b. gel filtration chromatography
  - c. combining information from (a) and (b)
  - d. isoelectric focusing
  
8. For the separation of DNA by electrophoresis, which of the following method is commonly used?
  - a. Agarose – vertical
  - b. Agarose – horizontal
  - c. PAGE – vertical
  - d. PAGE – horizontal



9. Sodium dodecyl sulfate (SDS) used in SDS PAGE is

- a. An anionic detergent
- b. A cationic detergent
- c. A non-ionic detergent
- d. An anion exchanger

10. Function of  $\beta$ -mercaptoethanol in SDS-PAGE is

- a. To give negative charges to amino acids in the proteins
- b. For the oxidation of disulfide bonds in the proteins
- c. For the reduction of disulfide bonds in the proteins
- d. For breaking hydrogen bonds in the proteins

**Answer the following questions**

**10x3=30**

- 1. Write the principle of agarose gel electrophoresis. Write the application of it.
- 2. Write the principle of SDS PAGE. Write the application of it.
- 3. Write the differences between SDS PAGE and Native PAGE. Write the application of native PAGE.





✚ **SAMPLE CERTIFICATE OF COURSE COMPLETION**

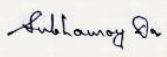


 **CERTIFICATE  
OF COURSE COMPLETION**


THIS IS TO CERTIFY THAT

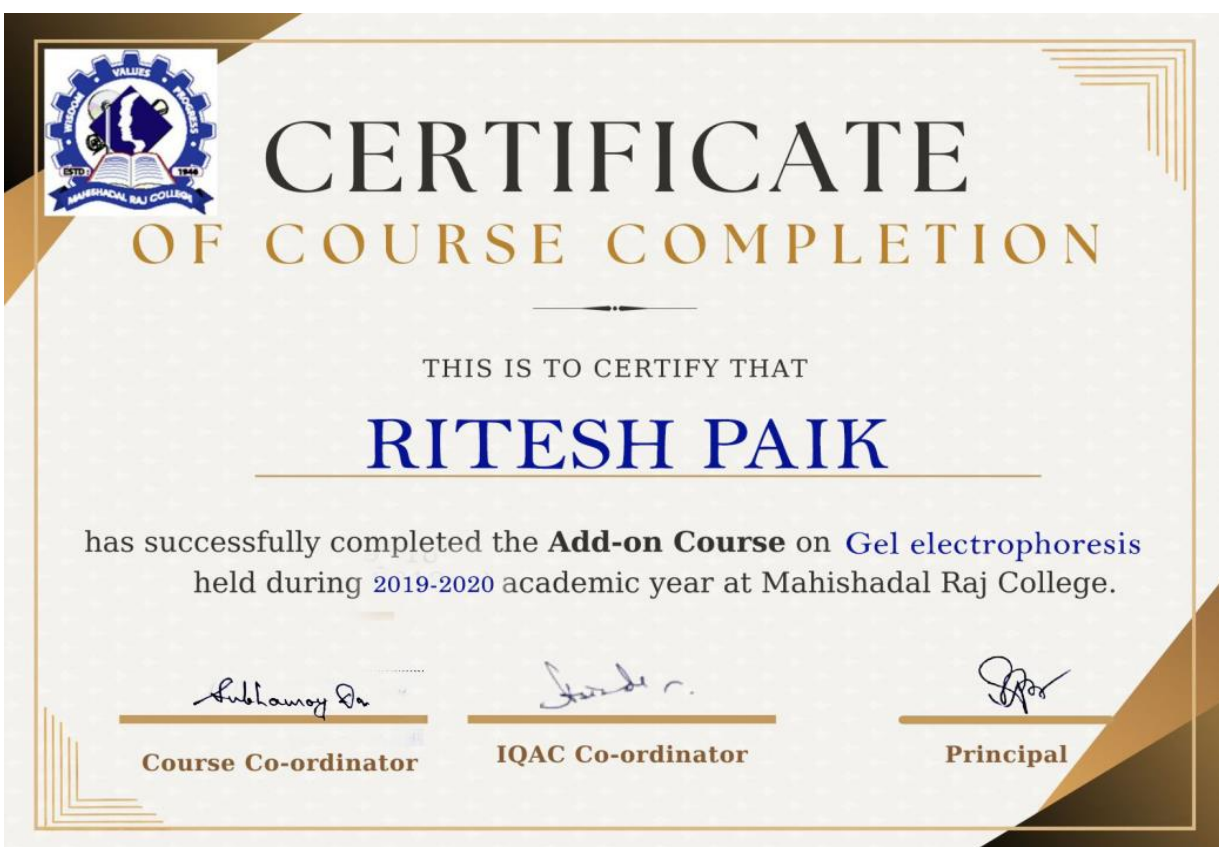
**BIBHAS GAYEN**


has successfully completed the **Add-on Course** on **Gel electrophoresis** held during **2019-2020** academic year at Mahishadal Raj College.

  
Course Co-ordinator

  
IQAC Co-ordinator

  
Principal

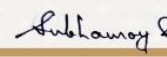



 **CERTIFICATE  
OF COURSE COMPLETION**

THIS IS TO CERTIFY THAT

**RITESH PAIK**

has successfully completed the **Add-on Course** on **Gel electrophoresis** held during **2019-2020** academic year at Mahishadal Raj College.

  
Course Co-ordinator

  
IQAC Co-ordinator

  
Principal