



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:

Online ADD ON COURSE 2020-21

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: 02.12.2020

Date of completion: - 16.12.2020

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 |
|----------|-----|---|------------|----------|-----------------------|-----------------------------|
| 02.12.20 | 1 | Orientation & Introduction to molecular biology technique (T) | 12 to 2pm | 2 | Dr. Subhamoy Das | HOD DEP. of ZOOLOGY |
| 03.12.20 | 2 | Gel electrophoresis (T) | 1 to 3 pm | 2 | Dr. Rajkumar Guchhait | SACT Mahishadal Raj College |
| 04.12.20 | 3 | Agarose gel electrophoresis for DNA (T+P) | 3 to 5pm | 2 | Dr. Rajkumar Guchhait | SACT Mahishadal Raj College |
| 05.12.20 | 4 | DNA sample preparation (T+P) | 03 to 05pm | 2 | Dr. Rajkumar Guchhait | SACT Mahishadal Raj College |
| 06.12.20 | 5 | Sample loading and gel run (T+P) | 02 to 04pm | 2 | Dr. Rajkumar Guchhait | SACT Mahishadal Raj College |
| 07.12.20 | 6 | Visualization and results interpretation (T+P) | 01 to 03pm | 2 | Dr Rajkumar Guchhait | SACT Mahishadal Raj College |
| 08.12.20 | 7 | Agarose gel electrophoresis for RNA and sample preparation (T+P) | 03 to 05pm | 2 | Prof. Sagnik Mandal | SACT Mahishadal Raj College |
| 09.12.20 | 8 | RNA sample loading, gel run, visualization and data interpretation. (T+P) | 02 to 04pm | 2 | Prof. Sagnik Mandal | SACT Mahishadal Raj College |



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|----------|----|--|------------|----------|--|--------------------------------------|
| 10.12.20 | 9 | SDS PAGE (T) | 02 to 04pm | 2 | Prof. Manik Das | SACT Mahishadal Raj College |
| 11.12.20 | 10 | Sample preparation for SDS PAGE (T+P) | 01 to 03pm | 2 | Prof. Manik Das | SACT Mahishadal Raj College |
| 12.12.20 | 11 | Protein sample load and gel run | 02 to 04pm | 2 | Prof. Manik Das | SACT Mahishadal Raj College |
| 13.12.20 | 12 | Visualization of band and data interpretation. | 02 to 04pm | 2 | Prof. Manik Das | SACT Mahishadal Raj College |
| 14.12.20 | 13 | Native PAGE and Sample preparation. | 01 to 03pm | 2 | Prof. Moumita Jana | SACT Mahishadal Raj College |
| 15.12.20 | 14 | Gel run, visualization, and data interpretation. Doubts clear and revision | 01 to 03pm | 2 | Prof. Moumita Jana | SACT Mahishadal Raj College |
| 16.12.20 | 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 | | |
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Course structure and examination scheme:

| Course name | Theory classes (hr.) | Demo 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/19/0487 | 2190487 | BRAJAGOPAL DINDA |
| 2 | B.Sc/19/0538 | 2190538 | SOUFYADIP GOSWAMI |
| 3 | B.Sc/19/0548 | 2190548 | MUKESH SASMAL |
| 4 | B.Sc/19/0551 | 2190551 | SURYAKANTA MANNA |
| 5 | B.Sc/19/0046 | 2190046 | RAJ BISWAS |
| 6 | B.Sc/19/0049 | 2190049 | PARAMITA MANTRI |
| 7 | B.Sc/19/0167 | 2190167 | SUMAN PURKAIT |
| 8 | B.Sc/19/0189 | 2190189 | DEBARATI BHOWMICK |
| 9 | B.Sc/19/0249 | 2190249 | ANUPAM SARDER |
| 10 | B.Sc/19/0251 | 2190251 | VIKRAM NATH |
| 11 | B.Sc/19/0252 | 2190252 | RITAM DINDA |
| 12 | B.Sc/19/0510 | 2190510 | PEKHAM GANGULY |
| 13 | B.Sc/19/0511 | 2190511 | DHRITIMAN BISWAS |
| 14 | B.Sc/19/0103 | 2190103 | NILKANTA SAMANTA |
| 15 | B.Sc/19/0104 | 2190104 | SUBHADEEP PRADHAN |
| 16 | B.Sc/19/0105 | 2190105 | ARNAB DAS |
| 17 | B.Sc/19/0107 | 2190107 | ARKA CHAKRABORTY |
| 18 | B.Sc/19/0108 | 2190108 | SOUMITRA PAUL |
| 19 | B.Sc/19/0109 | 2190109 | JOYDIP SINGHA |
| 20 | B.Sc/19/0284 | 2190284 | SWARNADIP MISHRA |
| 21 | B.Sc/19/0339 | 2190339 | KARTICK KAR |
| 22 | B.Sc/19/0509 | 2190509 | TAMAL DAS |
| 23 | B.Sc/19/0522 | 2190522 | ANUPAM BHOWMIK |
| 24 | B.Sc/19/0018 | 2190018 | SRABANI SAMANTA |
| 25 | B.Sc/19/0019 | 2190019 | DEBKUMAR DAS |
| 26 | B.Sc/19/0020 | 2190020 | TANIYA PANDA |
| 27 | B.Sc/19/0022 | 2190022 | TANIYA JANA |
| 28 | B.Sc/19/0023 | 2190023 | MUNMUN BHUNIA |
| 29 | B.Sc/19/0024 | 2190024 | BANASHREE SANTRA |
| 30 | B.Sc/19/0030 | 2190030 | AYAN SAHA |



Sample Question of Examination

1). When voltage 'V' is applied across a pair of electrode (cathode and anode), a potential gradient 'E' is created between the electrodes. We can calculate 'E' as:

- a. $E = V/d$
- b. $E = (1/V) \times q$
- c. $E = (Vd)/q$
- d. $E = V + d$

2). The velocity ('v') of a charged particles in an electric field in a medium can be mathematically expressed as $v = Eq/f$, where 'Eq' and 'f' are _____.

- a. Eq: Energy; f: Frictional force
- b. Eq: Electrical force; f: Gravitational force
- c. **Eq: Electrical force; f: Frictional co-efficient**
- d. Eq: Equilibrium constant; f: co-efficient of gravity

3). 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

4). 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
- e. A cation exchanger

5). Function of β -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

6). The ratio of velocity ('v') of biomolecule in a medium under constant electric field ('E') is called 'Electrophoretic mobility' denoted as ' μ '. ' μ ' is mathematically expressed as:

- a. $\mu = E/v$
- b. **$\mu = v/E$**
- c. $\mu = 1/(Ev)$
- d. $\mu = VE$

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**

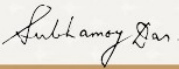


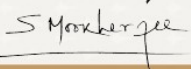
CERTIFICATE OF COURSE COMPLETION


THIS IS TO CERTIFY THAT

SOUMYADIP GOSWAMI

has successfully completed the **Add-on Course** on **Gel electrophoresis**
held during **2020-21** academic year at Mahishadal Raj College.


Course Co-ordinator


IQAC Co-ordinator


Principal



CERTIFICATE OF COURSE COMPLETION

THIS IS TO CERTIFY THAT

TANIYA JANA

has successfully completed the **Add-on Course** on **Gel electrophoresis**
held during **2020-21** academic year at Mahishadal Raj College.


Course Co-ordinator


IQAC Co-ordinator


Principal