

## LABORATORY MODULE 4

### GRAM STAIN



#### INTRODUCTION

The simple staining procedure makes it possible to see bacteria clearly, but it does not distinguish between organisms of similar morphology. Hence, **differential staining** was developed. It is a type staining technique that requires the use of at least four chemical reagents that are applied sequentially to a heat-fixed smear. The first reagent is called the **primary stain**. Its function is to impart its color to all cells. The second stain is a **mordant** used to intensify the color of the primary stain. In order to establish a color contrast, the third reagent used is the decolorizing agent. Based on the chemical composition of cellular components, the **decolorizing agent** may remove the primary stain from the entire cell or only from certain cell structures. The final reagent, the **counterstain**, has a contrasting color to that of the primary stain. Following decolorization, if the primary stain is not washed out, the counterstain cannot be absorbed, and the cell or its components will retain the color of the primary stain. If the primary stain is removed, the decolorized cellular components will accept and assume the contrasting color of the counterstain. In this way, cell types or their structures can be distinguished from each other on the basis of the stain that is retained.



#### OBJECTIVES

*Once this module has been completed, the student should be able to:*

- ➊ Explain the chemical and theoretical basis for differential staining procedures.
- ➋ Describe the chemical basis for the Gram stain.
- ➌ Perform the procedure to differentiate between two principal groups of bacteria: gram positive and gram negative.



#### DISCUSSION

The most important differential stain used in bacteriology is the **Gram stain**, named after Dr. Hans Christian Gram. It divides bacterial cells into two major groups, gram-positive and gram-negative, which makes it an essential tool for classification and differentiation of microorganisms.

# Lab Module 6 Gram Staining Introduction Clark College

**Huangqi Zhang**



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a four quadrant or multiple quadrant operation is required in industrial as well as commercial applications these applications require both driving and braking i.e. motoring and generating capability some of these applications include electric traction systems cranes and lifts cable laying winders and engine test loading systems

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paper proposes a way to govern the rate and route control of a dc motor with the help of a 4 quadrant dc dc chopper the speed under the base velocity may be controlled by way of armature voltage manage technique mosfets are used for the switching operation of the chopper the gates of those mosfets are given pwm

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the four quadrant chopper block represents a four quadrant controlled chopper for converting a fixed dc input to a variable dc output the block contains two bridge arms each bridge arm each has two switching devices options for the type of

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3 four quadrant operation of dc motor four quadrant operation or mode of any dc motor means that machine operate in four quadrants they are forward breaking mode forward motoring mode reverse breaking or stop mode and reverse motoring mode a motor operates in two modes motoring and breaking a motor drive capable of

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this paper gives a control for three phase brushless dc bldc motor in all four quadrant operation the control system in this paper is capable to detect and identify the rotor position by sensor signal 1 in this paper behaviour of bldc motor is studied in all four quadrant operations through simulation model

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may 11 2021 a four quadrants dc chopper fqdc has been developed to work with a series motor for the application of dc drive electric vehicle in previous work capable of operating in such driving conditions and offers several types of chopper operation modes such as driving and reverse regenerative and resistive braking generator mode field weakening

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aug 8 2020 1 answer sorted by 1 you can think of the first quadrant operation as being a buck converter down from the supply to the motor you can think of the second quadrant as being a boost converter from the motor s generated low voltage up to the supply voltage

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put simply the four quadrants that the controller can work in are 1 motor going clockwise controller applying clockwise drive 2 motor going anti clockwise controller applying anti clockwise drive 3 motor going clockwise controller applying anti clockwise drive 4 motor going anti clockwise controller applying clockwise drive

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four quadrant operation of dc motor means that the machine operates in four quadrants they are forward braking forward motoring reverse motoring and reverse braking a motor operates in two modes motoring and braking

experiment 6 four quadrant operation of dc motor - Mar 15 2023

1 to observe the four quadrant operation of a dc motor 2 to control a motor under torque control 3 to couple the speed control motor and torque controlled motor and observe the effect of a stepped torque 6 2 four quadrant operation of a dc motor the four quadrant operation is performed by giving an alternating reference speed command to

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aug 16 2021 the four quadrant operation of the motor can be described as follows quadrant i in the first quadrant the developed power by the motor is positive thus the motor operates in motoring mode and converts electrical energy into mechanical energy therefore the operation of the motor in first quadrant is called forward motoring quadrant ii

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the control of bldc motor in four quadrants is very crucial in this paper bldc motor is controlled in all the four quadrants without any wastage of power during regenerative braking period power generated is being stored in the chargeable battery

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