

Table of Contents

Introduction

Safety Worksheet

Exercise 1: How do scientists collect and analyze data?

Exercise 2: How do scientists prepare solutions with specific concentrations of solutes?

Exercise 3: A. Understanding pH and buffers
B. Introduction to the brightfield microscope

Exercise 4: Cell Structure and Diversity

Exercise 5: How are substances transported within cells and across cell membranes?

Exercise 6: What factors affect enzyme activity?

Exercise 7: How is thin layer chromatography used to separate a mixture of molecules?

Exercise 8: Isolating, purifying, and characterizing proteins

Day One: *How can α -lactalbumin be separated from the other molecules in milk?*

Day Two: *What is the concentration of protein in your milk fractions?*

Day Three: *How can gel electrophoresis be used to separate the proteins present in your milk fractions?*

Day Four: *How can gel electrophoresis be used to analyze the milk fractions that were collected during your purification of α -lactalbumin?*

Exercise 9: How are plasmids used in recombinant DNA technology?

Day One: *Transformation of E. coli and digestion of plasmid DNA with restriction enzymes*

Day Two: *Which unknown plasmid sample had no plasmids, which had non-recombinant pUC18 plasmids, and which had recombinant pUC18 plasmids?*

Exercise 10: Using Biological Databases on the Internet

Appendix A: Keeping a Laboratory Notebook

Appendix B: Mean and Standard Deviation Calculations

Appendix C: Calibration of Instruments

Appendix D: Absorbance Measurements

Appendix E: Graphing Data

Appendix F: Math Review