

# Parkland College Bio 141 Laboratory Exercise Synopses

## Lab 1: Micropipettes and Spectrophotometers: Data Collection and Analysis

- Students dispense multiple aliquots of specified volumes of distilled water using micropipettes. They then determine the mass of the water dispensed using an analytical balance and analyze the precision and accuracy (% error) afforded by their use of the micropipettes. Students also use a Spectrophotometer (Spec200) to determine the wavelength maximally absorbed by a biurets reaction on a protein.

## Lab 2: Quantitative Analysis of a Protein (BSA)

- Students will perform a serial dilution on a stock solution of BSA. They will then perform a biurets test on the solutions of known concentration generated by their serial dilutions. Then they use a Spec200 to create a standard curve of absorption at the wavelength previously determined to be maximally absorbed by this reaction. They then use this standard curve to determine the BSA concentration of an unknown solution.

## Lab 3: Characterization of a Serum Albumin Protein

- Students perform paper chromatography on a series of several amino acids to determine their relative solubility in an organic solvent. They then use these values to determine the amino acids present in a hydrolyzed protein. Students also separate different proteins (Hemoglobin, Myoglobin, Cytochrome C and Serum Albumin) via agarose gel electrophoresis. This allows exploration of the isoelectric points of these proteins and their protonation state at a given pH.

## Lab 4: Cell Structures

- Students use dissecting and compound microscopes to examine their own cheek cells as well as prokaryotic cells (*Oscillatoria*) and eukaryotic cells (*Oedogonium*). They also do cell fractionation via centrifugation of peas. They then analyze the supernatant and pellet for the relative abundance of amyloplasts.

## Lab 5: Osmosis and Diffusion

- Using dialysis tubing membrane and solutions of starch, reducing monosaccharaides and proteins, students design their own experiments to determine which, if any, of these biomolecules can diffuse across the membrane. Students also examine plant cells (*Elodea*) under a compound microscope before and after the application of a hypertonic 10% NaCl solution.

## Lab 6: Enzyme Enquiry

- Students design their own experiments to examine the effects of various environmental effects on the rate of reaction of the enzyme hydrogen peroxidase. Students choose to vary either pH, temperature or concentrations of ions ( $\text{Na}^+$  and  $\text{Cl}^-$ ), substrate or enzyme to study their effects on the rate of enzyme activity. The rate of the reaction is assayed by small discs of paper accumulating one of the products of the reaction ( $\text{O}_2$  bubbles).

## Lab 7: Cell Respiration

- Students will fabricate respirometers to examine the relative rates of cell respiration of yeast

cells in solutions containing various concentrations of glucose. They will then quantitate this rate by titrating naphthalene into the solution to see the amount of CO<sub>2</sub> produced.

#### Lab 8: Photosynthesis

- Students will perform paper chromatography on an extract of spinach plants to separate and examine various pigment molecules present in photosynthetic plants. Students will also perform a variety of experiments designed to examine the requirements of light, chlorophyll and CO<sub>2</sub> for Photosynthesis. Starch and Oxygen bubble production will be assayed to determine Photosynthetic activity.

#### Lab 9: Mitosis

- Students will examine prepared slides of rapidly dividing plant (Onion Root Tip) and animal (Whitefish Embryos) tissues under a compound microscope. They will be asked to identify cells in each of five different stages of Mitosis and Interphase. They will also examine slides of Onion Root Tips in which mitosis has been inhibited by the drug Colchicine.

#### Lab 10: Genetics: Patterns of Inheritance

- Students will perform a series of crosses between Wild-type and mutant (*White-eye* or *Sepia*) fruit flies (*Drosophila melanogaster*). They will then perform a statistical analysis on the observed offspring phenotype to determine the inheritance pattern displayed by the two different mutations.

#### Lab 11: PCR

- Students will use a thermocycler to perform Polymerase Chain Reactions on DNA samples provided (Edvotek Kit #372). They will also be pouring their own electrophoresis gels for running the PCR products.

#### Lab 12: DNA Technology

- Students will isolate DNA from wheat germ. They will also determine the father of a hypothetical child using DNA Fingerprinting techniques (Edvotek Kit #114).

#### Lab 13: Bacterial Transformation

- Students will use plasmid DNA of Green or Blue Florescence Protein to transform *E. coli*. They will then examine the number of transformants to determine the efficiency of the technique.

#### Lab 14: Restriction Enzyme Mapping

- Students will digest a plasmid with two different restriction enzymes singly and in combination (double digest). They will then run the results on an electrophoresis gel and use the resulting products to map the relative position of the enzyme cut-sites on the plasmid.