

## **Workshop on Science and Technology Teaching and Research**

University of Liberia, Monrovia Campus

A. E. Cohen, B. I. Rapoport, E. B. Wood (Organizers)

J. S. Sandikie (Faculty Host), E. Dennis (President)

14-25 June 2010

### **Day 1:**

Lab: Diffraction Grating Spectroscopy

Lecture: Light and the Electromagnetic Spectrum

Introductory Questionnaire

Lab: Heart Rate Before and After Exercise, Collecting and Plotting Histograms of Heart Rate Data, Dealing with Incomplete Data

### **Day 2:**

Class Problem: Plotting Histograms of Family Size, Interpretation of Graphical Data, Mean and Mode

Lecture: Review of Problems on Introductory Questionnaire (Brown Streak Virus and Cassava Growth)

Lab: Calorimetry to Measure Energy Density in Candles

### **Day 3:**

Lecture: Interpreting Graphical Information, Interpretation of Slope as Rate

Lab: Making Scales with Rubber Bands and Measuring Tapes

Class Problems: Order-of-Magnitude Approximations

### **Day 4:**

Lecture: Orders of Magnitude and Scientific Approximation

Class Problem: Approximately How Many Rubber Trees are on the Firestone Plantation?

Class Problem: Approximately How Many Calories can be Captured in Food Crops from Solar Energy Shining on Liberia?

Lab: Ohm's Law with Batteries and Graphite-on-Paper Resistors

Lecture: The Structure of Scientific Papers

Project Work

### **Day 5:**

Lab: Lime Batteries, Series and Parallel Circuits, Maximizing Voltage and Current Output

Lab: DNA Extraction from Tomatoes

Project Work

### **Day 6:**

Lecture: Exponential Growth

Demonstration: Exponential Growth via Paper Folding

Example: Exponential Growth of Bacteria

Class Problem: Compound Interest as Exponential Growth

Demonstration: Microbiology (Preparation and Finger-Print Inoculation of Water-Bottle Agar Plates)  
Project Work

**Day 7:**

Project Work

Lab: Electrolysis of Water into Oxygen and Hydrogen with a Motorcycle Battery

Lab: Electroplating

Lab: Microbiology (Preparation and Finger-Print Inoculation of Water-Bottle Agar Plates)

Lecture: Household-Scale Water Treatment Methods

**Day 8:**

Project Work

Lab: Water Sample Analysis

Lab: Soil Analysis

Lab: Colorimetric Analysis of Starch Content in Foods (Iodine Test)

Class Demonstration: Simulation of Disease Spread

**Day 9:**

Project Work

Lab: Colorimetric Analysis of Protein Content in Foods (Biuret Test)

Lab: Measuring Oxygen Consumption by a Burning Candle

Lab: Microfluidics for Capillary Action and Laminar Fluid Flow

Lab: Osmosis with Raisins in Sugar Water

**Day 10:**

Final Project Presentations

Presentation of Certificates of Completion

**Literature Distributed:**

Nutrition Curriculum and Nutrition Information on Foods Commonly Eaten in Liberia

Nutrition Primer

CD containing Medical and Public Health Texts

CD containing Curriculum Materials and Textbooks for Chemistry, Physics, and Mathematics

Recent Copies of Science and The New England Journal of Medicine

**List of Final Project Topics:**

Bacterial Growth (Preparation and Finger-Print Inoculation of Water-Bottle Agar Plates Before and After Hand Sanitizing, Effects of Antibiotics)

Calorimetry

Colorimetric Analysis of Starch Content in Foods

Current and Voltage Characteristics of a Graphite-on-Paper Resistor

Analysis of Drinking Water Quality from Sources Around Monrovia

Analysis of the Energy Production Scheme Proposed by Buchanan Renewables  
(Electricity from Old Rubber Trees)  
Analysis of Methods for Solid Waste Management Around Monrovia  
Electrochemistry and Electroplating  
Intervention to Reduce Diarrhea in a Liberian Town  
Methods of Preserving Local Foods  
Measurement of Reduction Potential of Metals  
Nutrition and Malnutrition, Hydration and Dehydration for Liberian Children  
Quantitative Analysis of Local Recipes for Oral Rehydration and Feeding Malnourished  
Children  
Soil Chemistry  
Preparation of Laboratory Manuals for Classroom Use in Liberia (Based on Workshop  
Activities)