LABORATORY 10 – ELECTROCARDIOGRAPHY

Purpose:

This experiment focused on recording and analyzing electrocardiograms (ECG) to study the heart's electrical activity. ECG, derived from the electrical potentials between specific points on the body, helps assess the heart's function. The study aimed to analyze ECG leads I, II, and III and explore the implications of Einthoven's Law in the ECG measurements.

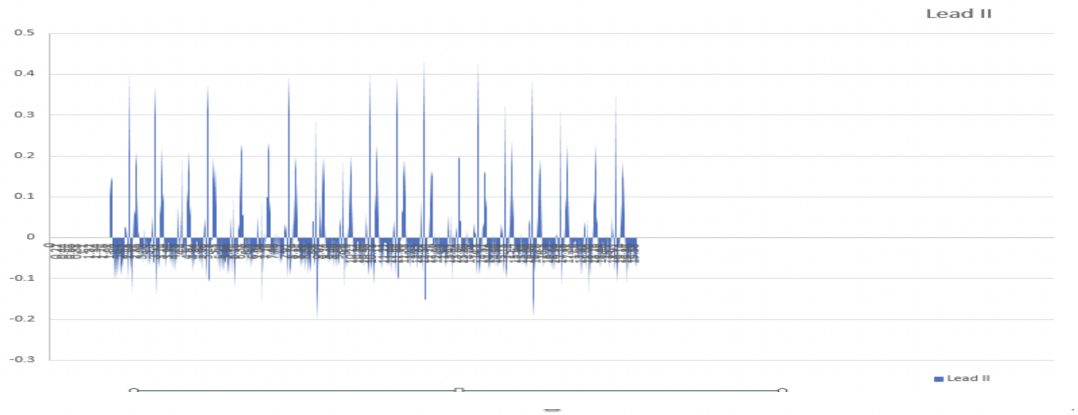
Procedures:

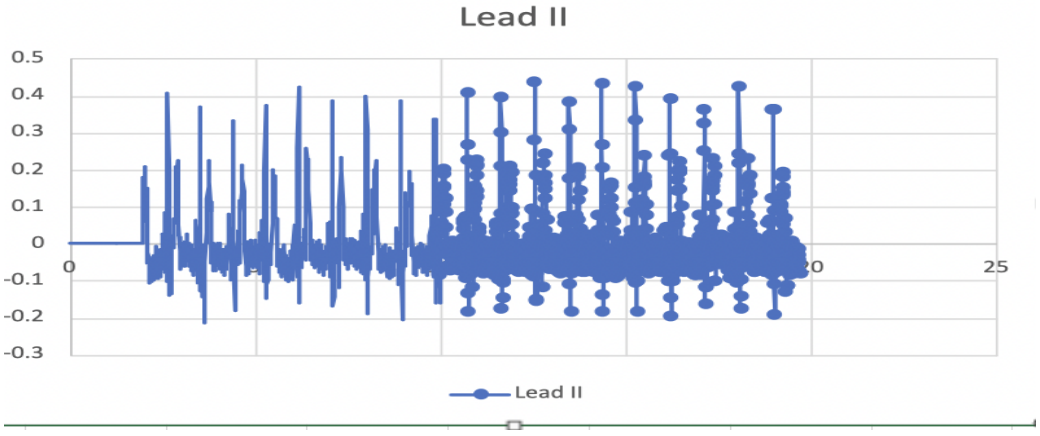
- Setting Up the Equipment:
  - Ensure the IWX/214 unit is connected to the laptop via USB and that the C-AAMI-504 EEG cable is properly inserted into Channels 1 and 2 of the IWX/214. Connect the lead wires to the corresponding electrodes based on the provided instructions.
- Configuring Labscribe3:
  - Open Labscribe3 and navigate to the "Human Heart" tab, selecting "ECG-HeartSounds" to configure the ECG settings.
- Preparing the Subject:
  - Clean the subject's right wrist, left wrist, and right ankle areas with alcohol swabs. Attach electrodes to these locations: black (-1) on the right wrist, red (+1) on the left ankle, and green (ground) on the right ankle.
- Recording Lead II ECG:
  - Instruct the subject to sit quietly with hands in the lap to avoid movement affecting the ECG. Start recording by clicking the "Record" button. Adjust settings if needed for a clear trace.
  - Stop the recording after approximately one minute. Label one set of the five ECG waves (P, Q, R, S, T).
- Recording Lead I ECG:
  - Keep the electrodes on and move the red (+1) lead wire from the left ankle to the left wrist. Start recording Lead I, following similar steps as in Lead II recording.
- Recording Lead III ECG:
  - Move the red (+1) lead wire back to the left ankle and the black (-1) lead wire from the right wrist to

the left wrist. Begin recording Lead III, following the same procedure as before.

- **Analyzing V2-V1 Amplitudes:**
  - Use the "Half Display Time" option to adjust the Display Time on the Main window to show around four complete ECG/pulse cycles.
  - Analyze V2-V1 amplitudes in each lead by adjusting red cursor lines in the Main window. Record the amplitude readings for all three leads.
- Further Analysis via Labscribe3:
  - If needed, use the Analysis window in Labscribe3 to view and record the V2-V1 amplitude values for each lead.
- Applying Einthoven's Law:
  - Calculate and compare the cumulative V2-V1 amplitudes for leads I and III against the amplitude in lead II.
  - Note any discrepancies observed and evaluate whether Einthoven's Law, stating that the sum of leads I and III should equal lead II, is fulfilled.

Results:

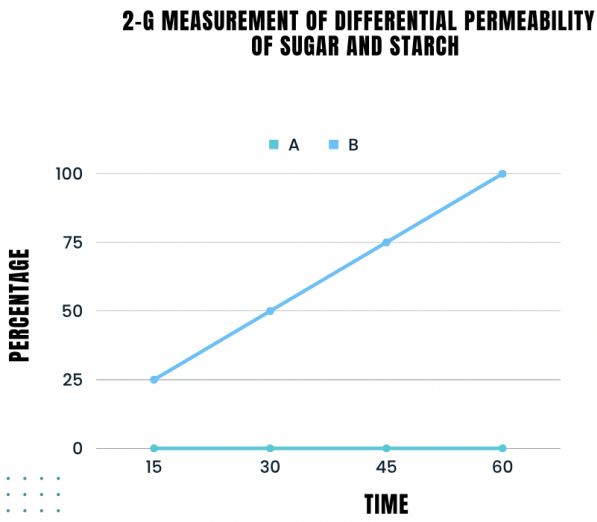




Discussion: Challenges were encountered in electrode placement, affecting signal quality. Analysis tools in Labscribe3 posed limitations in accurately measuring amplitudes, impacting Einthoven's Law evaluation. However, utilizing Excel improved data analysis, showcasing its adaptability in scientific experiments.

Conclusion: The experiment highlighted challenges in ECG recordings and software limitations. Utilizing Excel unexpectedly enhanced data analysis. This experience emphasized adaptability and the unforeseen learning potential in utilizing supplementary tools for scientific analysis.

2-G Measurement of differential permeability of sugar and starch



Discussion: In conclusion, the series of experiments delved into fundamental biological processes, yielding valuable insights. The investigation of diffusion through liquids unveiled the temperature's impact on diffusion rates, with a constructed graph illustrating the relationship. Diffusion through agar highlighted the role of molecular properties in varying diffusion rates. The filtration experiment underscored how solution thickness affects filtration dynamics. Osmosis experiments provided a comprehensive view of water movement across membranes, emphasizing osmotic equilibrium. Differential permeability insights elucidated membrane selectivity. Lastly, the tonicity experiment demonstrated cellular responses to different solutions. Collectively, these experiments contribute significantly to understanding diffusion, osmosis, filtration, and cellular behaviors under varying conditions, spanning

implications across scientific, medical, and engineering domains.

Conclusion: In conclusion, the experiments delved into diffusion, osmosis, filtration, and tonicity. These investigations shed light on temperature's effect on diffusion, filtration dynamics, water movement in osmosis, and the impact of tonicity on red blood cells. Collectively, they provide valuable insights into fundamental biological processes and their underlying principles.