Laboratory Work 11: Definition of Impedance of a Biological Object This laboratory work explores the impedance of biological objects. The basic concepts of alternating currents, including peak, effective values, frequency, and phase, are introduced. The experiment aims to determine the dependence of resistance on the frequency of alternating currents for inductive, capacitive, and biological materials. **Key Concepts:** * **Impedance:** Total resistance to alternating current in a circuit, considering both ohmic resistance and reactance. * **Rheography:** A method for studying blood circulation by measuring impedance changes in tissues. **The Purpose of the Work:** * To gain practical experience with electrical devices. * To experimentally determine the dependence of resistance on frequency for inductive, capacitive, and biological materials. * To calculate impedance and estimate the active resistance of a bioobject. **Theoretical Background:** * Alternating currents are essential for understanding physiological processes in living organisms and are used in therapeutic applications. * Alternating currents can cause irritating effects on tissues due to the movement of ions. * The frequency of alternating currents influences their physiological effects. * High-frequency currents are used for therapeutic warming of tissues (diathermy). * D'arsonvalization is another physiotherapeutic method using high-frequency currents. **Detailed Explanation of Alternating Current Circuits:** * The text provides a detailed analysis of the behavior of alternating currents in circuits containing resistance, inductance, and capacitance. * Formulas and vector diagrams are used to illustrate the relationships between current, voltage, and phase. * The concept of impedance is introduced as a generalization of resistance for AC circuits. **Impedance of Biological Fabrics:** * Biological tissues primarily exhibit ohmic and capacitive properties. * Equivalent electric schemes are presented to model the electroconductivity of biological fabrics. * The dependence of impedance on frequency is explained using these schemes. * The impedance of biological tissues is affected by their blood filling and is the basis of rheography. **Experimental Procedure:** * The experiment involves measuring voltage and current in a circuit containing a biological object. * The frequency of the alternating current is varied, and the measurements are recorded. * Impedance is calculated based on the measured values. **Control Questions:** * The control questions test the understanding of the theoretical concepts and experimental procedures. * Topics include the characteristics of alternating currents, the behavior of AC circuits with different components, impedance calculations, and the application of rheography.

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