

DL 3155

BIOMEDICAL EQUIPMENT



The DL-3155 laboratory is about training the students to the areas of engineering that will be able to operate **biomedical equipment** in the medical equipment application field, in the design and manufacture of such equipment and in the public or private Hospitals for maintenance and repair of biomedical equipment. The laboratory consists of a set of simulators and equipment listed on the right of this page.

The laboratory deals with the main objective of the biomedical engineering which is the development of the necessary instrumentation in different application fields of the **medical practice**, such as **diagnosis, therapy** and **rehabilitation**.

The laboratory equipment is accompanied by the appropriate software to run interactively with PC workstations, wherever this is applicable. When an available program interfaces the PC with a simulator, it offers support in all the above training procedures and creates realistic simulations. PC is not provided.

The software is organized in subjects corresponding to the simulations and the experimental exercises with scope:

- A series of aims for the specific experiment and the level of knowledge that must be obtained.
- Theoretical background relevant to the lesson as well as practical examples of use.
- Tests/Questions for the students and fault testing.

The system is accompanied by technical manuals for theory and exercises. Each one of the lab equipment is described here in after.

DL 3155BIO1

Transducers

DL 3155BIO2

Amplifiers

DL 3155BIO3

Filters

DL 3155BIO4

Conversion

DL 3155BIO5

ECG - EEG - EMG

DL 3155BIO6

Cardiac rhythm

DL 3155BIO7

Breathing temperature

DL 3155BIO8

Galvanic skin resistance

DL 3155BIO9

Audiometer

DL 3155BIO10

T.E.N.S.

DL 3155BIO11

Magneto therapy

DL 3155BIO12

Electro stimulation

DL 3155BIO13

Laser therapy

DL 3155BIO14

Ionophoresis

DL 3155BIO15

Ultrasound therapy

DL 3155BIO16

Blood pressure monitoring

DL 3155AL2

Base frame with power supply & connection to PC

BIOLAB 1

Drink & Beverage Antioxidant Capacity

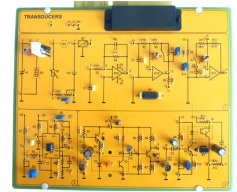
BIOLAB 2

Redox Status of an Individual

DL 3155BIO1 Simulator

Transducers

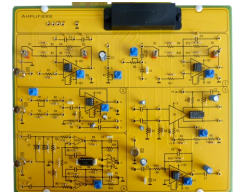
The DL 3155BIO1 Simulator deals with biomedical sensors and transducers. The classification criterion that has been used in this course for the sensors and the transducers is based on their physical operation principle. Resistive, optical or photoelectrical sensors and transducers, used in the temperature data and optical signals acquisition, are studied in this board.



DL 3155BIO2 Simulator

Amplifiers

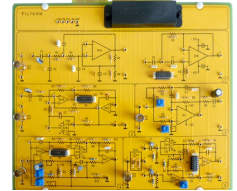
The electrical signal, generated by sensors, is usually at a low level of amplitude and power, so that it is necessary to amplify it before its transfer, further analogue or digital processing and visualization. In this course the DL 3155BIO2 Simulator enables the study of the characteristics of the pre-amplifiers and amplifiers for the processing of biomedical signals.



DL 3155BIO3 Simulator

Filters

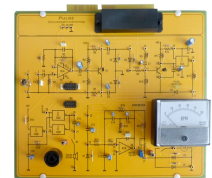
The DL 3155BIO3 Simulator provides the study of the devices that allow the passage of biomedical signals with given characteristics, while attenuating those that do not comply with the required parameters.



DL 3155BIO4 Simulator

Conversion

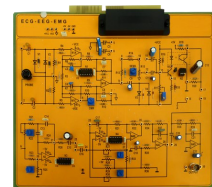
The events monitoring systems such as the frequency of the cardiac pulsations, the breathing frequency, etc., require an analogue signal to be converted to pulses and visualized on a display in order to be measured. In that way, the DL 3155BIO4 Simulator provides to students the study of some circuits for analogue to pulse conversion, sound indicator and analogue frequency meter.



DL 3155BIO5 Simulator

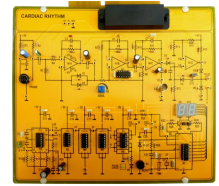
ECG - EEG - EMG

This course comprises a further instrument, the ECG SIMULATOR, which is mandatory to provide power supply to the circuit and provides a simulated ECG signal for performing experimental activity. The DL 3155BIO5 Simulator provides the study of all the general specifications of the systems for the measurement of bioelectrical signals and subsequently the characteristics of some special systems. The bio-electrical potentials are currently recorded as a routine in several specialties of the modern clinical practice. Such potentials are the result of an electrochemical activity of a class of cells, named excitable cells, that form the nervous, muscular and glandular tissues. The measurement of the bioelectrical phenomena is, therefore, used to learn the electrochemical activity of such tissues. The most widely used bioelectrical signals, such as the electrocardiogram, the electroencephalogram and the electromyogram, have very low amplitude and are generated by sources that have high internal impedance.



DL 3155BIO6 Simulator

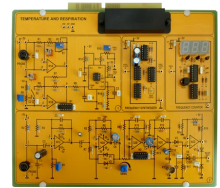
Cardiac rhythm



The DL 3155BIO6 Simulator provides the measurement of the frequency of the peripheral pulsations in a finger that follow the cardiac rhythm. In every heartbeat the arterial blood pressure raises (systolic period) and the dimension of the tips of the fingers slightly increases, while the higher oxygenation causes the decrease of the optical density of the skin tissue. During the cardiac relaxation period (diastolic period) the pressure decreases, the density increases and the physical dimension of the finger tips decreases.

DL 3155BIO7 Simulator

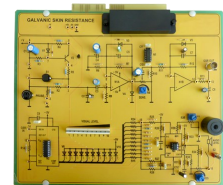
Breathing temperature



The DL 3155BIO7 Simulator provides the calculation of the breathing frequency by measuring the expansion or the contraction of the chest and also by measuring the movement of air that enters and exits from one nostril. The temperature of the body is mainly regulated by the hypothalamus. This region of the brain regulates the homeostatic mechanism that promotes both the production and the loss of heat. In spite of the changes in the environmental conditions, the hypothalamus keeps constant the internal temperature. Moreover, the external temperature of the skin is controlled by both the hypothalamus and the thermal sensors that cause both the afflux of blood to the skin and the perspiration. The breathing system transfers the oxygen to the blood and expels the carbon dioxide in the atmosphere.

DL 3155BIO8 Simulator

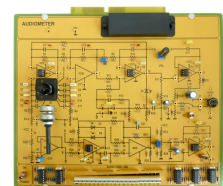
Galvanic skin resistance



The DL 3155BIO8 Simulator provides the recording of the changes of the galvanic resistance of the skin due to emotional or physical stimuli. At the passage of an electrical current, the skin shows a resistance that is normally within the 100kOhm to 1MOhm range. Such resistance decreases during periods of emotional stress. The changes of the resistance are particularly significant on the palm of the hands and on the plantar of the feet. Moreover, the surface of the skin shows an electrical potential, that can reach up to 50mV and that can equally be influenced by emotional states.

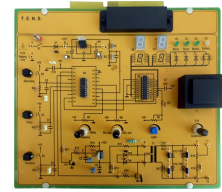
DL 3155BIO9 Simulator

Audiometer



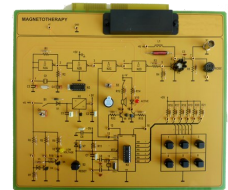
The DL 3155BIO9 Simulator is used in the medical field to measure the threshold of hearing sounds. An audio signal generator generates all the frequencies between 20Hz and 25kHz. The patient, through a headset, checks the level of sensitivity in his ears.

DL 3155BIO10 Simulator T.E.N.S.



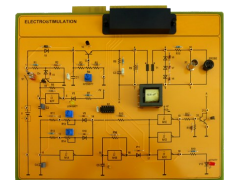
The DL 3155BIO10 Simulator is a typical circuit that is used in the transcutaneous electrical nervous stimulation, through which electrical pulses are able to perform an analgesic effect. T.E.N.S., or Transcutaneous Electrical Nerves Stimulation, is a particular low frequency waveform that once applied through electrodes in the area of the coetaneous projection of the pain (triggers area), allows an almost immediate and long-lasting reduction of the painful sensibility. For this reason it is an effective, safe and innocuous therapy for the treatment of all the muscle and skeleton pains, neuralgias, rheumatic pains, particular pains, headaches, lumbar pains, sciatic pains and other affections.

DL 3155BIO11 Simulator Magneto therapy



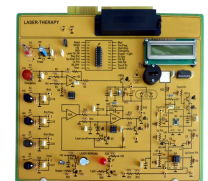
The DL 3155BIO11 Simulator is a typical circuit used for the main functions of the magneto therapy. Low frequency and low intensity magnetic fields and high frequency electromagnetic fields, where the magnetic component is almost equal to the electrical component, act on the whole body through an effect of substitution or activation of the missing electrical currents. Consequently, they cause a fast regeneration of the bony and cutaneous tissues and considerably increase the immune defenses of the body.

DL 3155BIO12 Simulator Electro stimulation

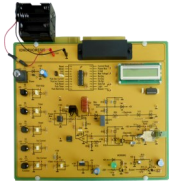


The DL 3155BIO12 Simulator is a typical circuit that is used in electro stimulation, main therapeutically effects in sport and beauty fields. The electro stimulation, or the involuntary muscular contraction that is caused by electrical pulses, is a practice used both in rehabilitation and in sport or fitness. It causes selective muscular contractions, more powerful and extended than those that are possible through voluntary efforts; it allows, without physical efforts, amazing results such as the increase of the tone and of the volume of the muscles; it increases the Metabolism of the fats with consequent reduction of the adipose zones; it tones up the muscles and it progressively reactivates the functionalities of limbs that need re-education.

DL 3155BIO13 Simulator Laser therapy



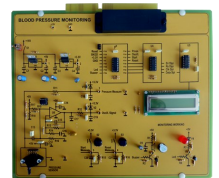
The DL 3155BIO13 Simulator is a typical circuit of an IR laser used in main applications of the laser therapy. I.R. is a beam of non visible, unidirectional and monochromatic light (since it is emitted in the infrared band) that transfers remarkable amounts of energy represented by photons. This radiation does not produce heat, it does not alter the tissues and it is not sensed by the patient that is under therapy. It performs an anti-inflammatory and revitalizing action.

DL 3155BIO14 Simulator
Ionophoresis

The DL 3155BIO14 Simulator is a typical circuit that is used in the ionophoresis and its main therapeutic effects. The ionophoresis is a technique that allows the substances in ionic form to penetrate from the surface of the skin to the deeper layers through a current. These substances, named active principles, of different dimensions and molecular weights, become extremely effective because they act inside the skin tissues at higher concentrations.

DL 3155BIO15 Simulator
Ultrasound therapy

The DL 3155BIO15 Simulator is a typical circuit used in main applications of the ultrasound therapy. The penetration power of ultrasounds in the tissues of the human body has revolutionized the field of medical diagnostics. This property is successfully used also in physiotherapy, where ultrasounds have demonstrated a remarkable curative validity in several affections, such as arthritis, lumbagos, particular stiffness and many others.

DL 3155BIO16 Simulator
Blood pressure monitoring

The DL 3155BIO16 Simulator is a typical circuit used for measurements of the blood pressure and heart beat, the evaluation of the average cardiac rate and the blood pressure monitoring. In blood vessels there must be a certain pressure in order for the blood to flow properly. Each heart beat causes a pressure wave that is transferred to the arteries. The upper value (systole) is the maximum pressure that is recorded in the artery in consequence of the heart beat. The lower value (diastole) corresponds to the pressure that we have in the arteries between two heart beats. Therefore, it is necessary to properly evaluate the pressure and its variability through a pressure and heart beat digital meter.

DL 3155AL2 Frame
Base frame with power supply and connection to PC

The DL 3155AL2 Frame is an interface board with power supply for connection to PC with robust structure and modern design. It provides voltage regulation and protection against over voltage or short circuit and it comes complete with a set of connecting cables.

BIOLAB 1 Portable lab kit

Drink & Beverage Antioxidant Capacity

A compact, easy to use, portable lab kit which allows the USER to measure drink and beverage antioxidant capacity.

The set offers all required equipment - instruments to conduct the above tests and a specially developed application which guides the user in every step of the testing procedure.



SCIENCE FACTS

Free radicals are highly unstable molecules that are naturally formed when you exercise and when your body converts food into energy. Your body can also be exposed to free radicals from a variety of environmental sources, such as cigarette smoke, air pollution, and sunlight. Free radicals can cause, "oxidative stress" a process that can trigger cell damage. Oxidative stress is thought to play a role in a variety of diseases including cancer, cardiovascular diseases, diabetes, Alzheimer's disease, Parkinson's disease, and eye diseases such as cataracts and age-related macular degeneration.

Antioxidants are man-made or natural substances that prevent or delay some types of cell damages. Antioxidant molecules have been shown to counteract oxidative stress in laboratory experiments (for example, in cells or animal studies). Diets high in vegetables and fruits, which are good sources of antioxidants, have been found to be healthy. Examples of antioxidants include vitamins C and E, selenium, and carotenoids, such as beta-carotene, lycopene, lutein, and zeaxanthin.



THE OBJECTIVE



Biolab was created in order to offer to the scientific lab and the market a simple, specific lab tool, at low cost, which can easily and practically estimate the antioxidant effect of our every day consumed drinks and beverages i.e. Coffee, tea, juices, wine, beer, Sodas etc. It is a test set based on a simplified method using the DPPH technique and produces very high accuracy results.

Biolab technology in combination with its low cost, portability and simplicity, aims to cover the need of internal (not outsourced) testing, measurement, and determination of the antioxidant capacity of various type Drinks and Beverages produced by different groups in the sector of this Industry (Producers, Bottlers, Distributors, etc.) in order to either improve or maintain the quality of their products by knowing its antioxidant capacity.

The software application of BioLab V1.0 has been developed jointly by Kondle SA and Professor of Biochemistry D.KOURETAS-Phd.



IT INCLUDES

This portable lab tester is housed in an aluminum profile briefcase. It offers all the facilities needed to contact the testing and measurements including the application which drives the set process.

Its panel incorporates: ♦falcon tube holders, ♦a small stirrer, battery operated (batteries are removable), ♦Eppendorf tubes 2ml holders, ♦bottle holders and reusable bottles 4 x 50 ml, ♦a colorimeter with detection wavelength 520nm, 410nm powered by USB port and ♦an Android pad* which manages with the installed ♦BioLab 1.0 application the process and the measurements in a step by step procedure.

Additionally it includes:



- ♦One variable volume pipette (20 - 200ml)
 - ♦One variable volume pipette (100 - 1000 ml)
 - ♦Two sets of consumable tips for the pipettes (2x25pcs)
 - ♦One set of consumable eppendorf 2ml mini tubes (30pcs)
- Dimensions (LxWxH) : 38,5cm x 27cm x 12,5cm
Weight : 3,0 Kg (Including PAD)
Power: Battery 3V and USB port operated

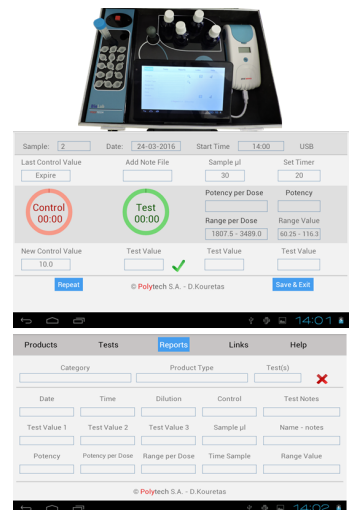


* Android pad: User can purchase his/her own Android PAD. Purchasing a PAD with BioLab is optional. Users PAD must be able to run on Android 4.4 or later version and must have 4G memory

BioLab V1.0
2016 © Kondle SA - D. KOURETAS

THE APPLICATION

BioLab V1.0 is the application which facilitates the user to manage all the test work as keeping inventory records of products and test samples, guide him in a step by step and time recording process, record the test results and evaluate them and finally create any type of reports. It offers a versatile data base for Products, categories and types, samples, reference values for testing results per category of product, timer and time stamps, on-line test value recording and acceptance, cross references and an on line help menu. It offers Links over the Internet to libraries or relevant documentation sites. It directs the user to the process of measurements in a step by step way, error proof. Alarms the user for any test results which do not fall within the limits according to referenced values. It offers a user friendly GUI, easy to operate.



CONSUMABLES

To perform the tests, a user will need the following consumables.

Consumables

- 1 Methanol 150 ml - Must be purchased locally
- 2 Pipette tips - 2 sets of 25 pcs in the initial Biolab kit
- 3 DPPH - Must be purchased locally
- 4 Eppendorf tubes – 30 pieces in the initial Biolab kit

BIOLAB 2 Portable lab kit

Redox Status of an Individual

A compact, easy to use, **portable lab kit** which allows the USER to assess an individual's **Redox Status**.

The set offers all required equipment - instruments to conduct the above test and a specially developed application which guides the user in every step of the testing procedure.



SCIENCE FACTS

Free radicals are highly unstable molecules that are naturally formed when your body converts food into energy as well as various exogenous sources, such as cigarette smoke, air pollution, and sunlight. When in excess, free radicals can be harmful, causing "**oxidative stress**" a process that leads to **cell damage**. Oxidative stress has been associated with a variety of diseases including cancer, cardiovascular diseases, diabetes and neurodegenerative diseases.

Antioxidants are man-made or natural substances that **prevent** or **delay** some types of **cell damages**. Antioxidant molecules have been shown to **counteract oxidative stress** in laboratory experiments (for example, in cells or animal studies). The most important endogenous antioxidant is **Glutathione**. The **Redox Status** of an individual denotes the current balance between oxidant and antioxidant molecules and provides information on whether a nutritional intervention with antioxidants is required or not.



THE OBJECTIVE

Biolab was created in order to offer to the scientific lab and the market a **simple**, specific **lab tool**, at **low cost**, which can easily and practically **estimate the redox status** of an individual by measuring the **Glutathione levels**. It is a test set based on a simplified method using the **DTNB** technique and produces very high accuracy results.



Biolab technology in combination with its low cost, portability and simplicity, aims to cover the need of internal (not outsourced) measurement of the redox status of an individual. This result when combined with the ones from Biolab 1.0 will provide the opportunity to determine the best course of action in terms of diet to ensure the improvement of the redox status.

The software application of BioLab V2.0 has been developed jointly by Kondle SA and Professor of Biochemistry **D.KOURETAS-Phd.**



IT INCLUDES

This portable lab tester is housed in an aluminum profile briefcase. It offers all the facilities needed to conduct the testing and measurements including the application which drives the set process.

Its panel incorporates: 4falcon tube holders, 4a small stirrer, battery operated (batteries are removable), 4Eppendorf tubes 2ml holders 4bottle holders and reusable bottles 4 x 50 ml, 4a colorimeter, with detection wavelength 520nm , 412 nm powered by a usb port and 4an Android pad* which manages with the installed BioLab 2.0 application the process and the measurements in a step by step procedure.

Additionally it includes:



- ◆ One variable volume pipette (20 - 200ml)
 - ◆ One variable volume pipette (100 - 1000 ml)
 - ◆ Two sets of consumable tips for the pipettes (2x25pcs)
 - ◆ One set of consumable eppendorf 2ml mini tubes (30pcs)
- Required auxiliaries:
- ◆ One centrifugal lab machine min 10.000 rpm (not provided with Biolab II, special purchase must be made).
- Dimensions (LxWxH) : 38,5cm x 27cm x 12,5cm
 Weight : 3,0 Kg (Including PAD)
 Power: Battery 3V and USB port operated



**Android pad: User can purchase his/her own Android PAD. Purchasing a PAD with BioLab is optional. Users PAD must be able to run on Android 4.4 or later version and must have 4G memory.*

BioLab V1.0
 2016 © Kondle SA - D. KOURETAS

THE APPLICATION

BioLab V2.0 is the application which facilitates the user to manage all the test work as keeping inventory records of products and test samples , guide him in a step by step and time recording process , record the test results and evaluate them and finally create any type of reports. It offers a versatile database including reference values for results, timer and time stamps, on-line test value recording and acceptance, cross references and an on line help menu. It offers Links over the Internet to libraries or relevant documentation sites. It directs the user to the process of measurements in a step by step way, error proof. Alarms the user for any test results which do not fall within the limits according to referenced values. It offers a user friendly GUI, easy to operate.



CONSUMABLES

To perform the tests, a user will need the following consumables.

- Consumables
- 1 Phosphate buffer 150 ml - Must be purchased locally.
 - 2 Pipette tips - 2 sets of 25 pcs in the initial Biolab kit.
 - 3 DTNB - Must be purchased locally.
 - 4 Eppendorf tubes - 30 pieces in the initial Biolab Kit.