Experimental Data Acquisition System

BIOLOGY SENSORS

Study on photosynthesis of terrestrial plants and the experiment result of increasing oxygen content

O_2

LW-B801
Range: 0~100%
· Measure O_2 content in air

Measuring O_2 content in forest with O_2 sensor

Study on the relationship between the duration of holding breath and the oxygen content in exhaled gas

Typical Applications:

The relationship between breath holding time and oxygen content in exhaled air; testing of exhaled air component and comparison with outside air; seed germination; photosynthesis of terrestrial plant; respiration of terrestrial plant; respiration of animal; respiration of saccharomycete; influence of different plants to surrounding environment.

CO_2

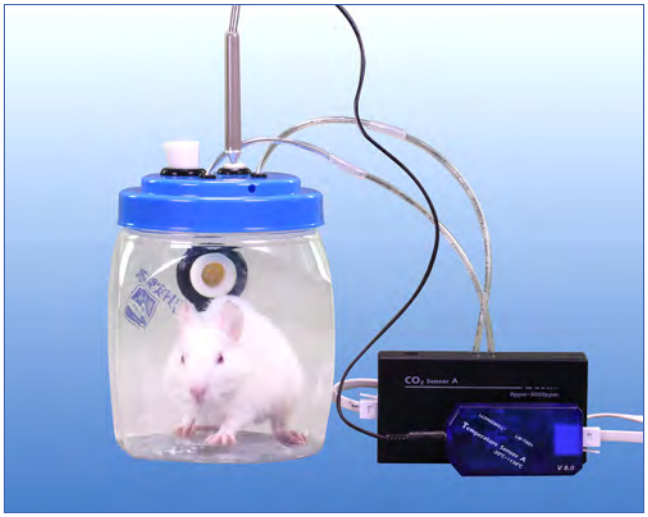
LW-B802/B804
Range: 0ppm~5000ppm/0ppm~50000ppm
Resolution: 1ppm/10ppm

· Air circulation by pump driving
· Measure the change of CO_2 content in the air

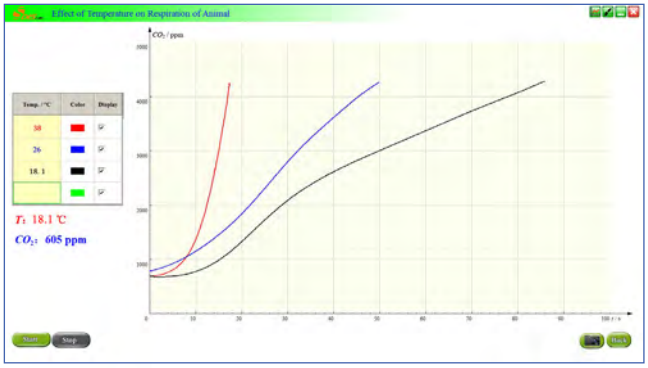
CO_2 C

LW-B806
Range: 0ppm~5000ppm
Resolution: 1ppm/10ppm

Adopts diffusive design and can measure the dynamic change of carbon dioxide content in the air.



Effects of temperature on animal respiration (figure above) and results (figure below)



Typical Applications:

Photosynthesis of terrestrial plant; tespiration of terrestrial plant; tespiration of animal; influence of temperature to photosynthesis; influence of temperature to respiration; difference between exhaled air and outside air; comparison between exhaled air and combustion gas; study on seed germination process; study on the respiration of saccharomycete and two respiratory modes; study on the reaction between baking soda and vinegar; study on the reaction between sodium carbonate and hydrochloric acid, etc.

Relative Humidity

LW-B807
Range: 0~100%
Resolution: 0.1%
· Measure water vapour content in air

Measuring the ambient relative humidity using relative humidity sensor and sensor data display module

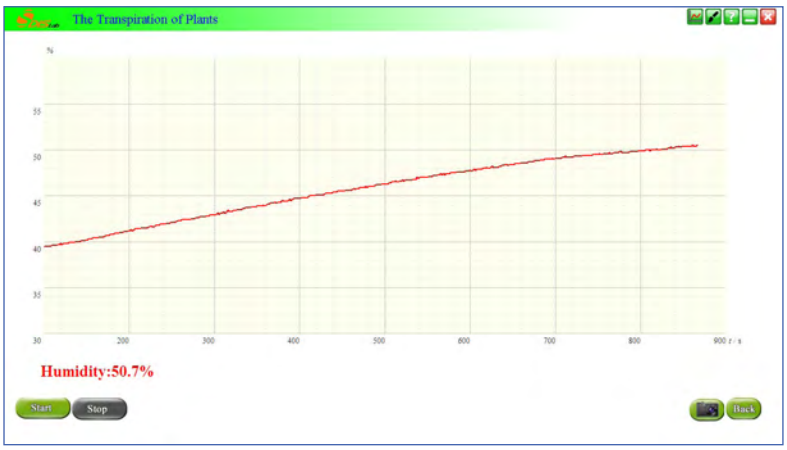
The optimum humidity environment for people's daily activities as below:

Housing environment: 40%~70%RH
The optimum environment for disease prevention and cure:40%~55%RH
Storage environment of books and cultural relics:40%~60%RH
Storage of cotton and wooltextiles: 40%~60%RH
Storage of confectionery: 50%~60%RH
Storage of fruits and vegetables: 50%~70%RH

Experiment Example-Transpiration:

► Principle: Transpiration is the process that moisture being scattered into atmosphere in state of vapor from live plant surface (mainly leaf). Plant transpiration can be verified with change of relative humidity in sealed container tested by a relative humidity sensor.
► Apparatus: data logger, relative humidity sensor, green plant, sealed gas liquid container etc.
► Results: See graph above and graphs on the right.

Transpiration experiment of plants (figure above) and results (figure below)



Typical Applications:

Plant transpiration; difference between exhaled air and outside air; influence of different plants to surrounding environment; regulation of body perspiration to body temperature; influence of AC dehumidification to indoor humidity etc. The sensor proble can be easily put into the sealing container to obatian experiment data precisely.

O_2 Sensor (Dissolved)

LW-B831
Range: 0mg/L~20mg/L
Resolution: 0.01mg/L
· Measure oxygen dissovled in liquid
· With the temperature compensation function

Working Principle of O_2 Sensor (Dissolved):

Molecular oxygen in the air, which can be dissolved in water, is also called dissolved oxygen, usually recorded as DO and denoted by milligram of oxygen in every liter of water. Amount of dissolved oxygen in water is an important index of self-purification capability of water. Water temperature and air pressure are main factors influencing oxygen's dissolve in water. The higher the air pressure and the lower the water temperature, the more oxygen dissolved in water.

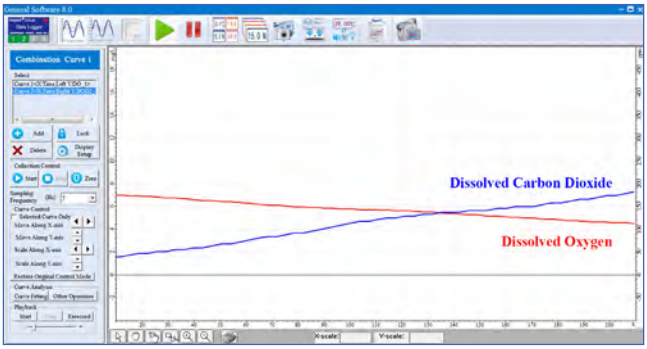
CO_2 Sensor (Dissolved)

LW-B832
Range: 4.4ppm~1800ppm
Resolution: 0.1ppm
· Measure CO_2 dissolved in liquid

Typical Applications:

Respiration of fish; photosynthesis of aquatic plants; photosynthesis of aquatic animals; respiration of saccharomycetes.

Respiration experiment of fish (figure above) and results (figure below)



The experiment of study on the respiration of saccharomycetes by using CO_2 Sensor (Dissolved)

ORP

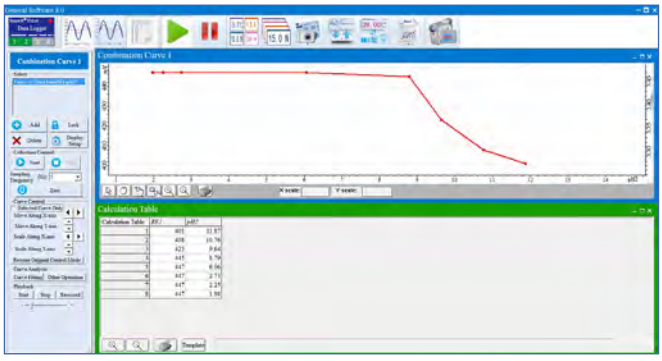
LW-C805
Range: -500mV~+1200mV
Resolution: 1mV
· Measure Oxidation-reduction Potential of solution

Working Principle of ORP Sensor:

Oxidation-reduction potential of solution—ORP value is the key index of reduction or oxidation of solution. ORP measurement is widely used for water quality analysis. If ORP value of water sample is less than 650mv, it means the water measured has been disinfected well.

Typical Applications:

Study on the change of oxidation-reduction potential during the growth of saccharomycete; study on the influence of ORP change in micro ecological system to the growth of aquatic plant; comparison of the effects of different disinfectants; water Quality Detection, etc.



Experiment result of study on the influence of pH value to the oxidation-reduction potential of $KMnO_4$

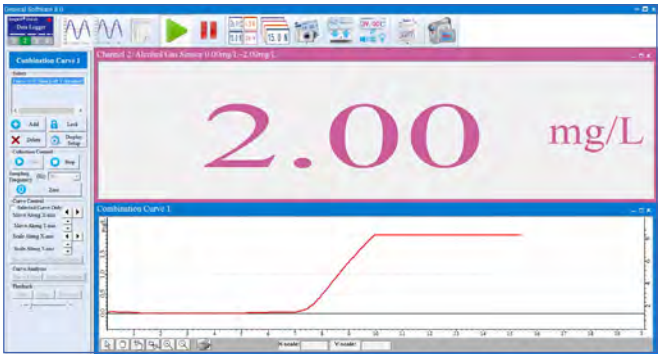
Gaseous Alcohol Sensor

LW-C842
Range: 0mg/L~2mg/L
· Measure alcohol content in air

Typical Applications:

· Compare the volatile gas from different alcohol; Measure the alcohol content in exhaled gas; Study of fermentation.

The volatile alcohol gas from dry red wine is lower obviously than that from Chinese liquor.

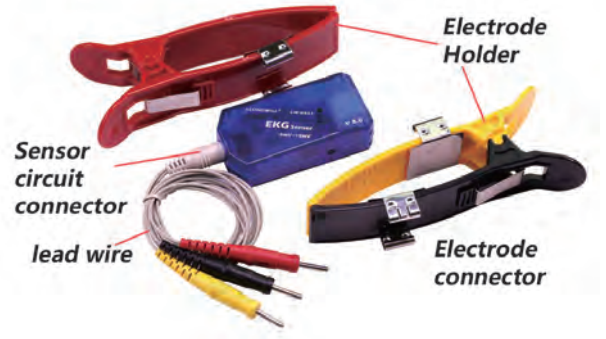


The reading of alcohol gas sensor surges, because there is much more alchol in Chinese Liquor than red wine

Examine the exhaled air of drivers warn drunk driving

EKG

LW-B851
Range: -5mV~+5mV
· Describe EKG curves

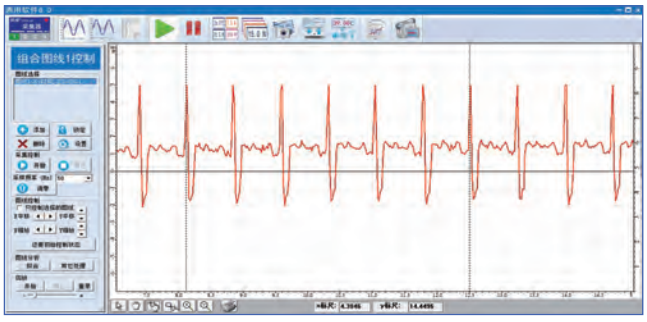


Typical Applications:

Display P wave, QRS wave; T wave and U wave in EKG and calculate the heart rate; study on EKG of human body under different conditions; compare the EKG of different animals.

Application Guide:

The connection principle is to make sure the holder's cable and the electrode holder in the same color. After connecting, clip the electrode holders in black and yellow on the left wrist, and then clip the electrode holder in red on the inside of the right wrist.



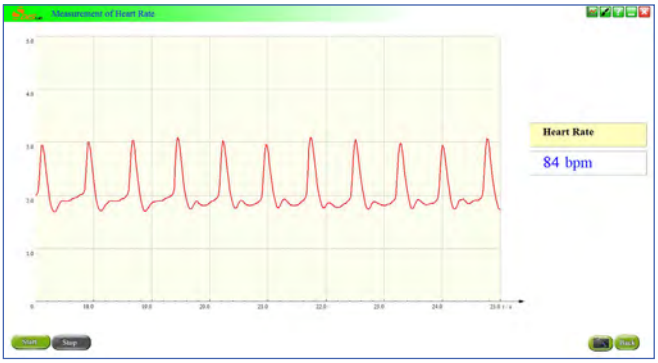
Heart Rate

LW-C853
Range: 0~200bpm
· Measure heart rate

Typical Application:

Heart rate measurement; comparison of heart rate between pre-exercise and post-exercise; the factors related to heart rate; the animals' heart rate.

Heart Rate measurement, results as below



Measuring results of heart rate

Respiration Sensor

LW-B852
Range: 0~200bpm

· Record the breathe time per minute
· Measure the respiration rate under different conditions

Typical Applications:

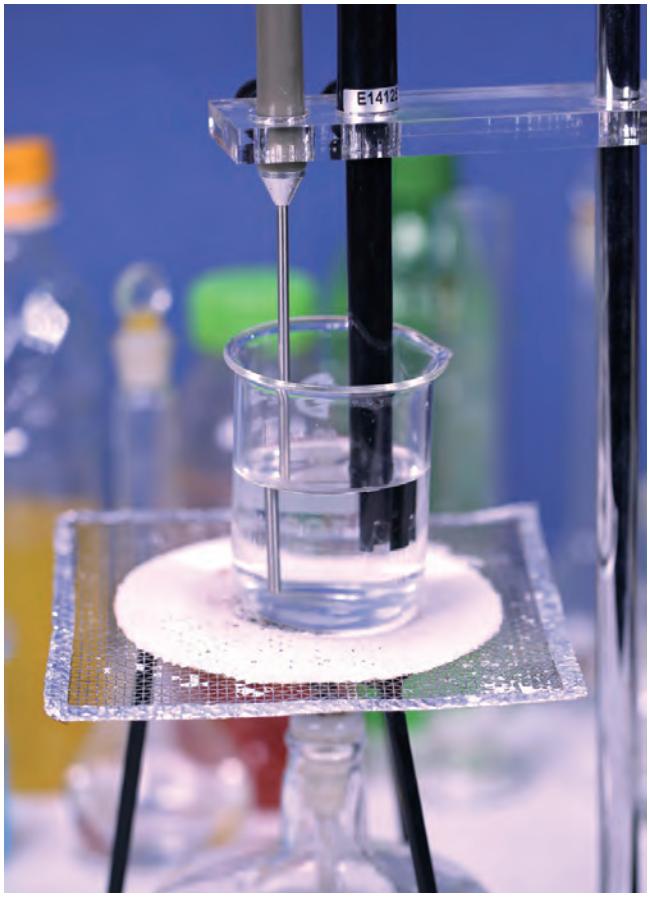
· Compare the respiration rate of different people with different sexes and ages
· Comparison of respiration rate between pre-exercise and after-exercise
· Study on the relationship between heart rate and respiration rate

General Sensors

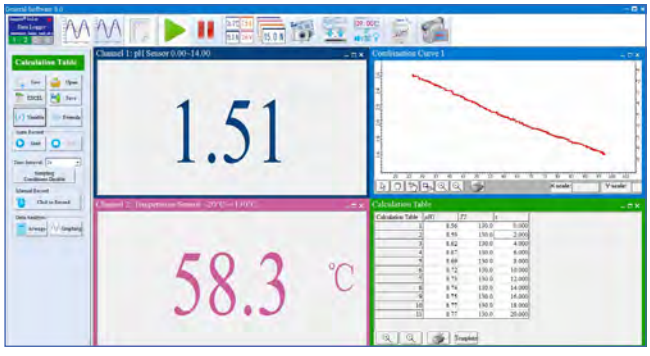
General science sensors can be used either for Physics experiments, or Chemistry experiments, and also can be used for Biology experiments, including temperature, pressure, current, voltage, micro-current, multi-range current sensor, etc. The above Physics sensors provide new experiment methods for Biology and Chemistry experiments, having significant role in enhancing experiment quantification and efficiency.

Temperature Sensor in Chemistry Experiment:

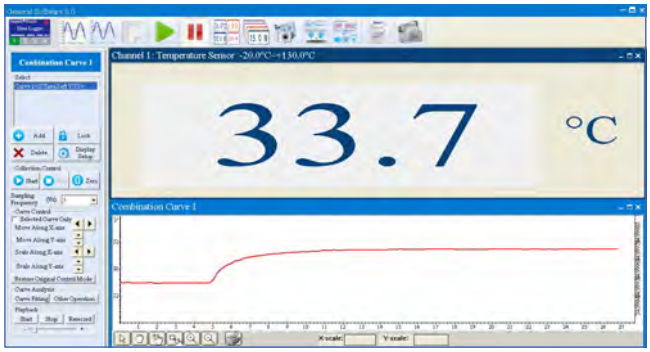
The temperature sensor can be used in experiments of Neutralization heat, heat of solution from acetic acid ionization equilibrium constant measurement, etc.



Study on the affect of temperature on of acetic acid ionization equilibrium constant, (results as below)



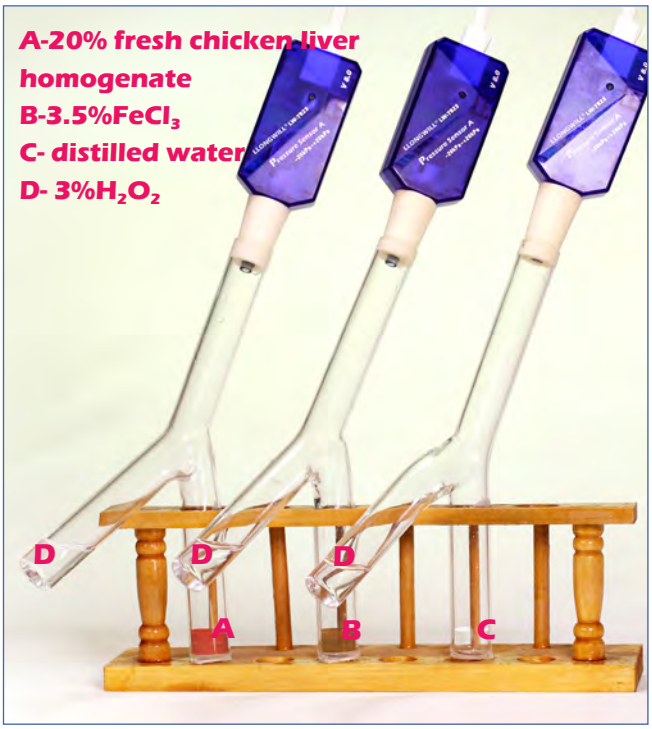
Neutralization heat experiment (NaOH + HCl) (above) and experiment results (below)



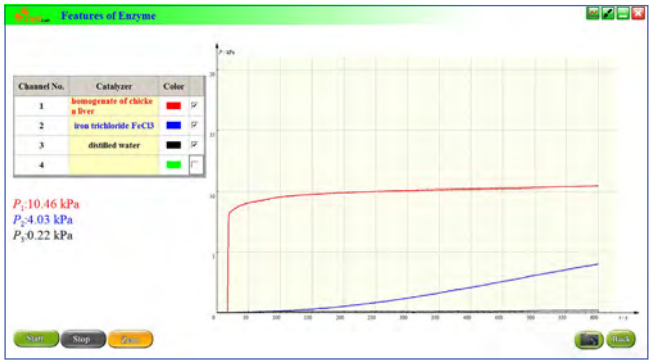
Heat of solution experiment (NaOH)

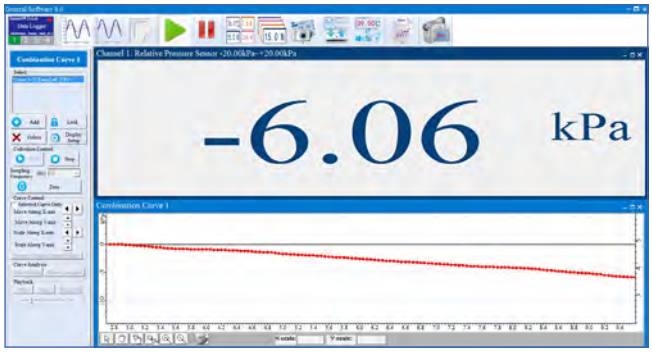
Relative Pressure Sensor in Biology and Chemistry Experiments:

· The comparison of the chemical reaction rate
· Characteristics of the enzyme
· Verification of the permeation
· Study on the water absorption and transportation in transpiration



Experiment of characteristics of the enzyme (above) and the results (below)





Experiment of chemical reaction rate comparison (above) and the results (below)

Experiment of water absorption and transportation in transpiration (right) and the results (above)

Electricity Sensors in the Application of Chemistry Experiments:

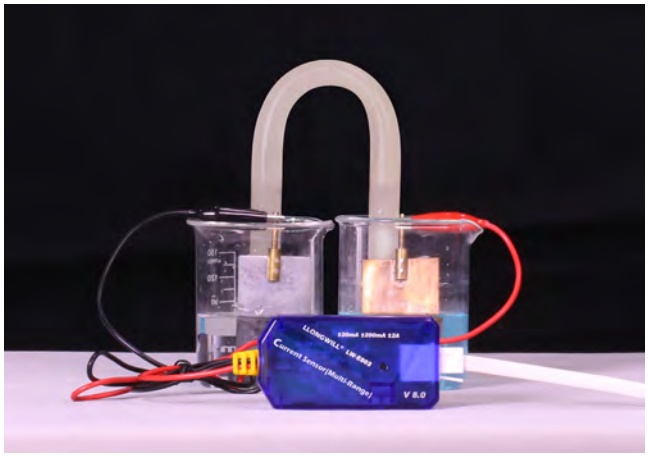
Many chemical reactions can be described as ion activities. Therefore, the electrical measurements are required to support chemical research, and thus produce an important branch of chemistry - electrochemistry. High school chemistry experiment, in part, is related to the content of electrochemistry, which contains the primary cell, electrolytic cell and molten potassium nitrate conducting and other experiments. Electricity sensors can give effective support to the above experiments.

Experiment Example I- *Study on Primary Cell:*

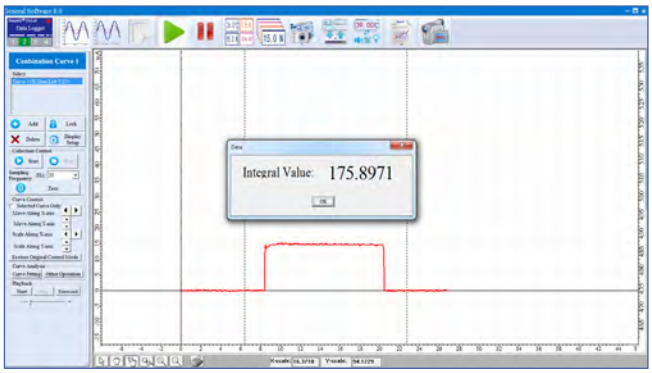
► Principles: The primary cell is a device which converts chemical energy into electric energy. In the copper-zinc primary cell, zinc atom loses two electrons, and the electrons flow from the negative electrode (zinc) to the positive electrode (copper), forming current.

► Apparatus and Reagents:

Data logger, multi-range current sensor, distilled water, copper-zinc primary cell, filter paper, 0.1mol / L HCl.



The effect of the distance between two electrodes to the primary cell, the results as below



Experiment Example II - *Study on Molten Potassium Nitrate:*

► Principles: Normal state of potassium nitrate has no electrical conductivity. But after being heated to a molten state, its chemical bonds will be broken and free particles with conductivity (K^+ and NO_3^-) will be producesd. Potassium nitrate melting point is 334 ℃, and it will be decomposed meanwhile oxygen will be released if above 400 ℃ .

► Apparatus and Reagents:

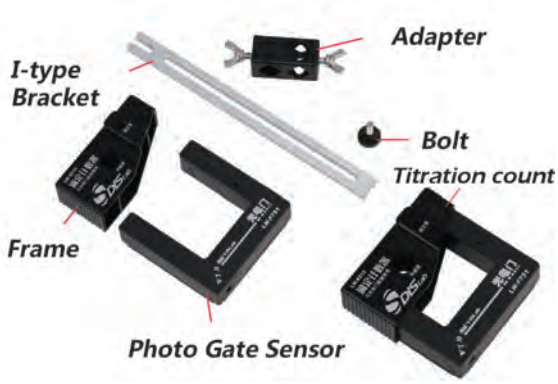
Data logger, current sensor, temperature sensor, crucible, alcohol lamp, graphite electrode, potassium nitrate (solid), wire, general supply etc. (see image right).

Experiment reuslts of Study on the conductivity of molten potassium nitrate (below)

Neutralization Titration Apparatus

LW-6212

Utility Model Patent No.:ZL200920019408.8



Design Concept:

Neutralization Titration Apparatus is developed based on the light blocking principle of Photo Gate Sensor. Because every droplet has similar volume, therefore the titration volume can be calculated after obtaining the number of the droplets.

Neutralization Titration Apparatus should be used with pH Sensor or Conductivity Sensor.

Use CH_3COOH solution to titrate with $NH_3 \bullet H_2O$ solution

Operation Instruction:

Before application, put Photo Gate Sensor into Frame , then these two parts make up a titration counter.

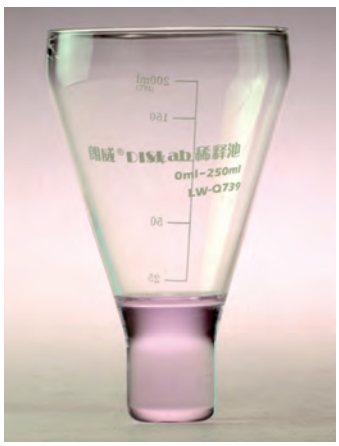
During application, adjust the titration counter to make sure there is a effective light blocking when the droplets pass the Photo Gate Sensor.

Open the software automatic record function; input the droplet volume and then record the number of droplets. Therefore the volume of titration can be calculated and the titration process is graphed on the software.

Dilution Vessel

LW-Q739

Utility Model Patent No.:201320572799.2



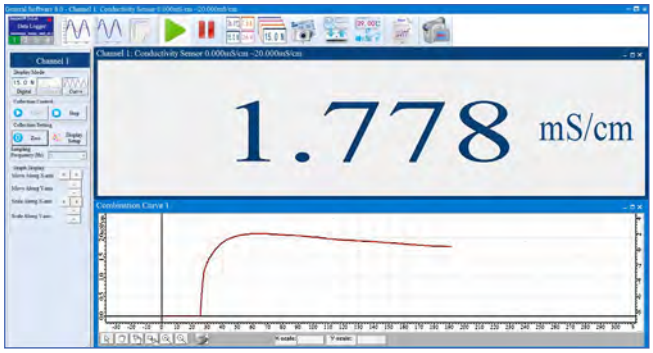
Design Concept:

Dilution Vessel is specially designed to research the glacial aceticacid dilution.

Doing this experiment requires to measure the conductivity changes with the sensor during the glacial acetic acid dilution process, therefore the change of the ion concentration can be obtained.

Product Structure:

It looks like upside-down conical beaker, with a small bottom and big open.
Experimental operation using the Dilution Vessel (is shown as image A).



The graph shows the experimental results of the glacial acetic acid dillution

Multifunctional Support

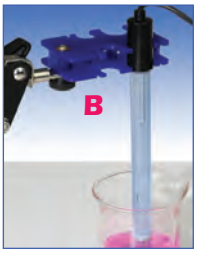
LW-Q731/LW-Q743

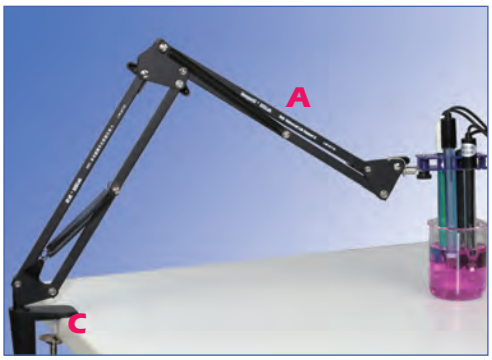
Design Patent No.:ZL201330383519.9
Utility Model Patent No.:201320487473.X

Composition and Typical Applications:

As shown in the figure on the right, multifunctional support is composed of mechanical arm A, the sensor electrode holder B, and aluminum clip C, The mechanical arm is fixed at the edge of the experiment table without occupying any table space. It can be folded and expanded. It can be moved flexibly and accurately located in the three-dimensional space with good stability.

The electrode clips are installed at the front end of the arm, whose diameter adapts to the electrodes of various biology and chemistry sensors. The multifunctional support can fix the electrodes of biology and chemistry sensors effectively, which is convenient for the operation of biology and chemistry experiments.





Experiment with multiple sensors using the Multifunctional Support

®Pocket Sealing Apparatus

LW-Q716

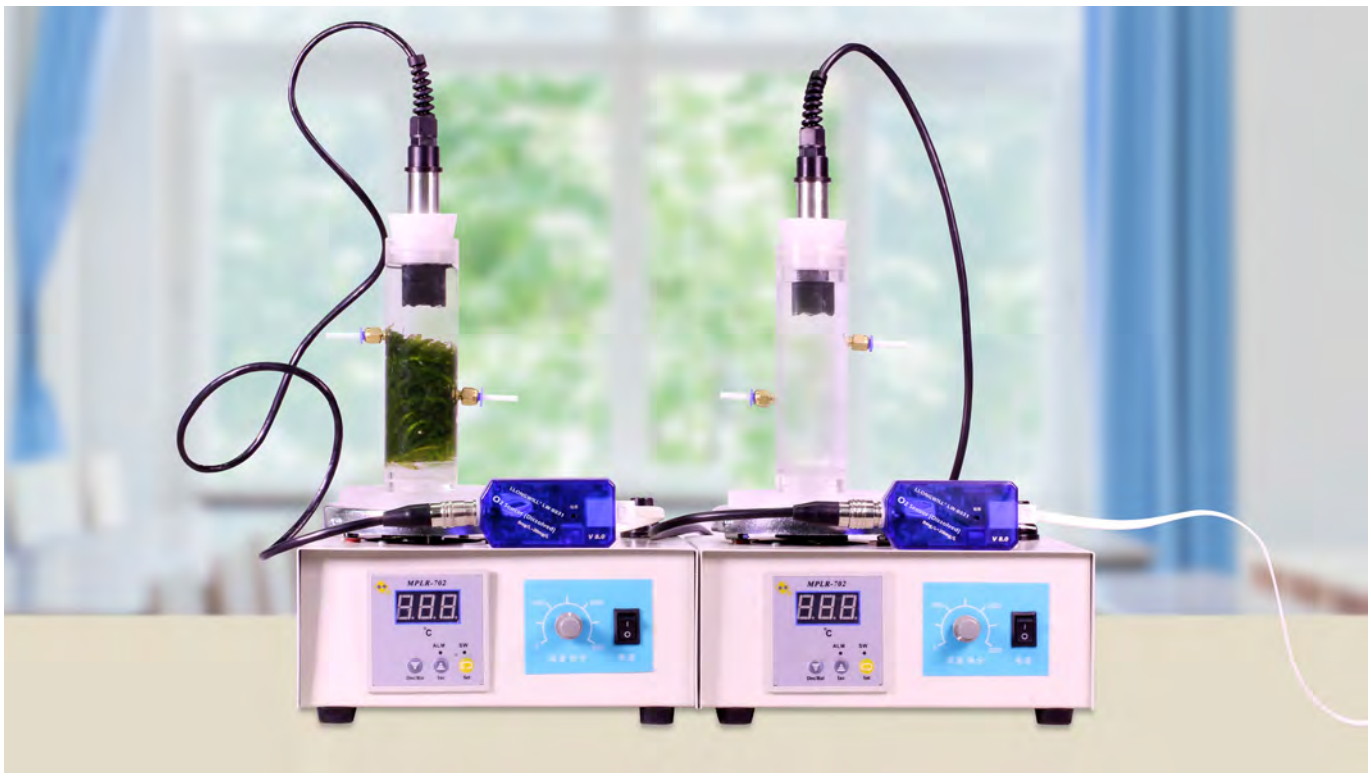
Components:

· Sealing Container
· Double-pass
· Double-pass Valves
· Sealing Plug

Typical Applications:

· Study photosynthesis of a single leaf
· Study capillarity action of plant root
Expand more experimental functions according to teaching requirements

Study on the photosynthesis of aquatic plants (as shown below)



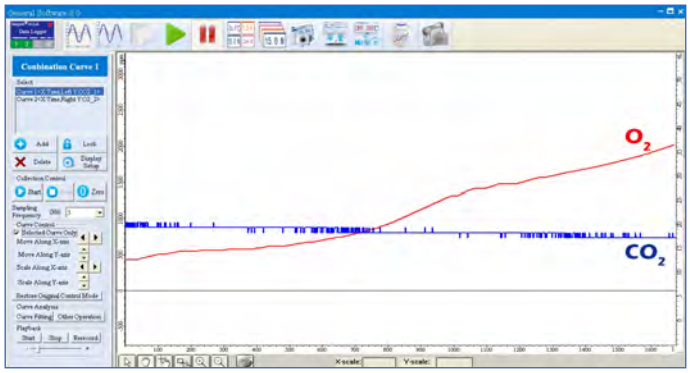
Sealing Apparatus

LW-Q749

Typical Applications:

· Photosynthesis and respiration of terrestrial plants
· Respiration of animals
· Seed Germination
· The characteristics of enzyme
· Burning characteristics
· Transpiration

This apparatus can load liquid, plants, other vessels and even some small animals. It creates a relative sealing experiment condition, by which some environment parameter can be controlled.



Experiment results of plant photosynthesis

Study on photosynthesis using sealing apparatus (as shown below)