SECTION 9

INDEX

CHEMISTRY

SUPPLIED ITEMS

1	Metallic bar	30	Centicubes
1	Tripod base	1	Latex tube
1	250 ml beaker	1	Iron cube
1	Double clamp, Ø13 mm	1	Sawdust bag
1	Bar with clip	1	Alcohol burner
1	Bent tube with plug	1	Flame-scatter net
1	100 ml erlenmeyer flask	1	Teaspoon
1	Rubber balloon	1	Universal pH indicator (1-10)
1	Thermometer -10+110°C	5	Test-tubes with plug
2	Watch glasses, Ø 60 mm	1	Sulphur bottle
1	Pencil dropper	1	Iron filings bottle
2	Candles with candle-holders	1	Sodium chloride bottle
1	Tripod support	1	Sodium carbonate bottle
1	Magnifying glass	1	Copper sulphate bottle
1	Capsule, Ø 60 mm	1	Calcium sulphate bottle
1	Wooden pincer	1	Iron powder bottle
1	Magnet	1	Methylated spirits bottle
1	Funnel	1	Hydrochloric acid bottle
1	Mohr pincer	1	Potassium sulphate bottle
1	Bar with ring	1	Methylene blue bottle
1	Stirrer	1	Experiments guide
20	Filter paper disks	1	Small case

5677 DISCOVERING CHEMISTRY

22 experiments

CONTENTS

1. Alcohol burner
2. Matter
3. Chemical phenomena
4. Compounds and elements
5. The three layers of matter
6. Fusion and consolidation
7. Vaporization and condensation
8. Mixtures: solid in solid
9. Mixtures: solid in liquid
10. Mixtures: liquid in liquid
11. Solutions
12. Crystals
13. Chemical reactions
14. Oxidation
15. Combustion
16. Indicators
17. Acidity analysis

5677

Basic level

SUPPLIED ITEMS

1	250 ml beaker	25	Paper filter disks
1	Double clamp ø 13 mm	1	Electrical kit with battery
1	Metallic bar	30	Centicubes
1	Bar with clip	1	Latex small tube
1	400 ml beaker	2	Metallic cubes
1	Bent glass tube with plug	1	Sawdust bag
1	100 ml erlenmeyer flask	1	Plexiglas plate
1	Tripod base	1	Sieve
2	Rubber plugs	1	Spoon
1	Rubber ballons	1	Universal pH indicator (1-10)
1	Thermometer -10+110°C°	1	25 ml cylinder
1	Tripod support	1	Potassium sulphate bottle
5	20x200 mm test-tubes	1	Methylene blue bottle
2	Watch glasses, Ø 60 mm	1	Hydrochloric acid solution bottle
1	Pencil dropper	1	Copper sulphate solution bottle
1	Alcohol burner	1	Methylated spirits bottle
1	Flame-scatter net	1	Sulphur powder bottle
2	Candles with candles-holder	1	Iron filings bottle
1	Magnifying glass	1	Sodium chloride bottle
1	Magnet	1	Sodium carbonate bottle
1	Funnel	1	Copper sulphate powder bottle
1	Mohr pincer	1	Calcium sulphate bottle
1	Capsule 60 mm	1	Iron powder bottle
1	Wooden pincer	1	Oleic acid bottle
1	Bar with ring	1	Experiments guide
1	Stirrer	1	Small case

5627 CHEMICAL PHENOMENA

26 experiments

CONTENTS

1. Alcohol burner
2. Matter
3. How to measure a molecule's diameter
4. Chemical phenomena
5. Elements and compounds
6. The three layers of matter
7. Fusion and consolidation
8. Vaporization and condensation
9. Mixtures: solid in solid
10. Mixtures: solid in liquid
11. Mixtures: liquid in liquid
12. Solutions
13. Crystals
14. Water cycle
15. Metals and non-metals
16. Chemical reactions
17. Oxidation
18. Combustion
19. Indicators
20. Acidity analysis

5627

Intermediate level

5629 CHEMISTRY

25 experiments

CONTENTS

1. Alcohol burner
2. Mass measures
3. Volume measures
4. Density measures
5. Fusion
6. Consolidation
7. Evaporation
8. Condensation
9. Fractioned distillation
10. Sublimation
11. Heterogeneous mixtures
12. Homogeneous mixtures
13. Solutions
14. Crystallization
15. Synthesis reactions
16. Single replacement reactions
17. Double replacement reactions
18. Decompositions reactions
19. Combustion
20. Organic substances

SUPPLIED ITEMS

1	250 ml beaker
1	Double clamp Ø 13 mm
1	Metallic bar
1	Pincer with clamp
1	100 ml beaker
1	Bent glass tube with plug
1	100 ml erlenmeyer flask
1	Tripod base
1	Nozzle glass tube
1	100 ml graduated cylinder
1	100 g scales
1	Thermometer, -10+110OC
1	Tripod support
1	Trasparent rubber tube
3	20x200 mm test-tubes
2	Rubber plugs with opening
1	Watch glass, Ø 60 mm
1	Pencil dropper
1	Alcohol burner
1	Flame-scatter net
1	Candles with candles-holder
1	Funnel
1	Mohr pincer
1	Capsule, Ø 60 mm
1	Bar with ring
1	Teaspoon with con spatula
1	Stirrer
1	Magnet
10	Filter paper disks
1	Bottle of hydrochloric acid 10% sol.
1	Distil water bottle
1	Sulphure powder bottle
1	Anthracite bottle
1	Iron powder bottle
1	Ammonium chloride bottle
1	Sodium chloride bottle
1	Barium sulphate bottle
1	Copper sulphate bottle
1	Ammonium carbonate bottle
1	Fuel bottle
1	Barium sulphate water bottle
1	Mothball water
1	Methylated spirits
1	Experiments guide
1	Small case

5629

Advanced Level

5516 CHEMISTRY SET

The four kits mentioned below:

5510 Physical and chemical phenomena
5511 General chemistry basis
5513 Electrochemistry
5515 Organic chemistry

They can be bought separately or as a unique set with a lower cost than the global cost of the four kits because some parts that are repeated in the 4 kits are eliminated when buying the set. The contents and the possible experiments of the set correspond to the sum of those contained in each kit. The kits permit to do experiments related to topics that are part of Chemistry lessons plan in senior high schools.
Two main features that make the set particularly efficient:

- quick assembly of the different parts and ease of use. These features meet user safety and lack of time;
- Contents clearly and unambiguously explained.

Each kit is fitted with there us a teaching guide in which every practical experiment is explained in detail.
At the end of every experiment a series of questions about the observed phenomena.
These kits are an essential aid for teachers and can also be useful for students collective experiments on specific subjects.

5516

Demonstrations from the teacher's desk

SUPPLIED ITEMS

- 1 250 ml beaker
- 1 Ø 13 mm clamp
- 1 Metallic bar
- 1 Pincer with clamp
- 1 100 ml beaker
- 1 Glass tube with plug
- 1 Tripod base
- 1 100 ml flask for filtration
- 6 Test-tubes, 16x160 mm
- 2 Rubber tubes, 100 cm
- 1 Tripod support
- 1 Watch glass, Ø 60 mm
- 1 Gas burner
- 1 Flame-scatter net
- 1 Magnet
- 1 Capsule, Ø 60 mm
- 1 Ni-Cr wire on glass
- 1 Wooden pincer
- 1 Bar with ring
- 1 Test-tubes cleaner
- 1 Stirrer
- 30 Filter paper disks
- 1 Coolant with joint
- 1 Double flexible spatula
- 1 100 ml sprayer
- 1 Funnel
- 1 Empty bottle
- 1 Potassium chloride bottle
- 1 Fructose bottle
- 1 Ammonium chloride bottle
- 1 Sodium sulphate bottle
- 1 30% solution of ammonium hydroxide
- 1 Barium chloride bottle
- 1 Distil water bottle
- 1 Copper sulphate (hydrate) bottle
- 1 Iron powder bottle
- 1 Sulphur powder bottle
- 1 Methylene blue bottle
- 1 Ferric chloride bottle
- 1 Experiments guide
- 1 Small case

5510 PHYSICAL AND CHEMICAL PHENOMENA

10 experiments

CONTENTS

1. Comparision between two kinds of phenomena
2. Sublimation
3. Filtration
4. Distillation
5. Crystallization
6. Mixtures and compounds
7. Chemical reactions examples
8. Flame tests

5510

Demonstrations from the teacher's desk

SUPPLIED ITEMS

- 1 250 ml beaker
- 1 Ø 13 mm clamp
- 1 Pincer with clamp
- 1 100 ml beaker
- 1 Tripod base
- 1 Funnel
- 1 Metallic bar
- 6 Test-tubes, 16x160 mm
- 1 Rubber tube, 100 cm
- 4 Rubber plugs
- 1 Thermometer -10+110OC
- 1 Tripod support
- 4 Test-tubes, 20x200 mm
- 1 Watch glass, Ø 60 mm
- 1 Pencil dropper
- 1 Gas burner
- 1 Flame-scatter net
- 1 Magnet
- 1 Mohr princer
- 1 Capsule, Ø 60 mm
- 1 Wooden pincer
- 1 Test-tubes cleaner
- 1 Stirrer
- 1 Ni-Cr wire on glass
- 1 Test-tubes support
- 1 Asymmetric "U" glass tube with plugs
- 1 Graduated pipette with joint
- 1 Steel wool flock
- 1 Double fexible spatula
- 1 50 ml graduated cylinder
- 1 Neutral litmus paper
- 2 Empty bottles
- 1 Fructose bottles
- 1 10% sulphuric acid solution
- 1 Barium chloride bottles
- 1 Iron powder bottle
- 1 Sulphur powder bottle
- 1 Lithium chloride bottle
- 1 Sodium chloride bottle
- 1 Potassium chloride bottle
- 1 Calcium chloride bottle
- 1 Strontium chloride bottle
- 1 Copper chloride bottle
- 1 Chloroform bottle
- 1 Magnesium chips bottle
- 1 Distil water bottle
- 1 Potassium dichromate bottle
- 1 1% phenolphtaleine solution bottle
- 1 Sodium hydroxide bottle
- 1 Calcium carbonate bottle
- 1 Barium hydroxide bottle
- 1 Potassium permanganate bottle
- 1 Potassium iodide bottle
- 1 Ferric sulphate bottle
- 1 Lead nitrate bottle
- 1 Ferric chloride powder bottle
- 1 10% chloride acid solution bottle
- 1 Experiments guide
- 1 Small case

5511 ORGANIC CHEMISTRY

11 experiments

CONTENTS

1. Lavoisier law
2. Proust law
3. Flame tests
4. Acid or basic compounds
5. Precipitation reactions
6. Formation of an aeriform compound
7. Redox reactions

5511

Demonstrations from the teacher's desk

5513 ELECTROCHEMISTRY

9 experiments

CONTENTS

1. Electrolytes conductibility
2. Comparision of electropositivity
3. Daniell battery
4. The electrolysis of a solution
5. The electrolysis of water
6. Electroplating

SUPPLIED ITEMS

- 4 250 ml beaker
- 1 Metallic bar
- 1 Tripod base
- 1 Pencil dropper
- 2 Cables, 60 cm
- 2 Electrodes-holder disks
- 1 Copper electrode
- 2 Brass electrodes with fixing bolts
- 1 Zinc electrode
- 2 Aligator clips
- 1 Funnel
- 2 Mohr pincers
- 1 Stirrer
- 1 Steel wool flock
- 1 Cotton flock
- 2 Batteries
- 2 Zinc foils
- 2 Copper foils
- 1 Symmetric "U" glass tube with plugs
- 1 Analogical multimeter
- 1 Voltmeter, joints and electrodes
- 2 Voltmeter supports
- 1 Double flexible spatula
- 1 100 ml sprayer
- 3 Bottles with plug
- 1 Sodium hydroxide bottle
- 1 10% sulphuric acid solution bottle
- 1 Potassium chloride bottle
- 1 Distil water bottle
- 1 Copper sulphate bottle
- 1 Silver nitrate bottle
- 1 Zinc Sulphate bottle
- 1 Sodium nitrate bottle
- 1 Potassium iodide bottle
- 1 Chloroform bottle
- 1 1% phenophtaleine solution bottle
- 1 Sodium sulphate bottle
- 1 Experiments guide
- 1 Small case

5513

Demonstrations from the teacher's desk

5515 ORGANIC CHEMISTRY

8 experiments

CONTENTS

1. Carbon and hydrogen in organic substances
2. Search for nitrogen in organic compounds
3. Acetic aldehyde preparation
4. Ethyl acetate preparation
5. Amino acids in proteic substances
6. Test of Fehling on some carbohydrates
7. Identification of a polysaccharide
8. Preparation of bakelite (polycondensation)

SUPPLIED ITEMS

- 2 250 ml beaker
- 1 Pincer with clamp
- 1 100 ml beaker
- 1 100 ml erlenmeyer flask
- 5 Test-tubes 16x160 mm
- 1 Thermometer -10+110OC
- 1 Tripod-stand
- 5 Test-tubes 20x200 mm
- 1 Burner with tube
- 1 Metallic bar
- 1 Tripod base
- 1 Flame-scatter net
- 1 Capsule, Ø 60 mm
- 1 Wooden pincer
- 1 Test-tubes cleaner
- 1 Pencil dropper
- 1 Stirrer
- 1 Ni-Cr wire on glass
- 1 Red litmus paper
- 1 Symmetric "U" tube with plugs
- 1 Water bath support
- 1 Double flexible spatula
- 1 25 ml graduated cylinder
- 1 Sawdust bag
- 1 Copper oxyde bottle
- 1 Barium hydroxyde bottle
- 1 Sodium hydroxide bottle
- 1 95% ethyl alcohol bottle
- 1 Potassium dichromate bottle
- 1 1N sulphuric acid bottle, 10% solution
- 1 Fehling A reagent bottle
- 1 1N chloride acid solution, 10% solution
- 1 1% ninidrine alcoholic solution
- 1 Fehling B reagent bottle
- 1 Fructose bottle
- 1 Glucose bottle
- 1 Lactose bottle
- 1 Starch bottle
- 1 Potato flour bottle
- 1 Bisublimate iodine bottle
- 1 Potassium iodide bottle
- 1 Distil water bottle
- 1 Phenol bottle
- 1 Ant aldehyde bottle
- 1 Experiments guide
- 1 Small case

5515

Demonstrations from the teacher's desk

CHROMATOGRAPHY

5517

SUPPLIED ITEMS

1	250 ml beaker	1	Glass test-tube
1	100 ml beaker	30	Filter paper disks
1	100 ml erlenmeyer flask	1	Pencil dropper
1	Filter paper sheet	1	Acetone bottle
1	Chromatography tray	1	Ether oil bottle
10	Plates for chromatography	1	Ethyl alcohol bottle
1	Funnel	1	Alumina bottle
1	Mortar	1	Chloride acid bottle, 10 % solution
1	Scissors	1	Solution 1% of ninidrine
1	Pipette	3	Coloured inks bottle
1	100 ml sprayer	1	Experiments guide
4	Test-tubes with plug	1	Small case

6237

5517 CHROMATOGRAPHY

CONTENTS
1. Chromatography on common filter paper
2. Division of pigments contained in green leaves through chromatography on paper
3. Division of some amino acids deriving from protein thanks to chromatography
4. Division of colorings in an ink
5. Separation of a colouring mixture using column division chromatography

5 POSSIBLE EXPERIMENTS

6237 **Replacement plates for chromatography on thin layer**
Pack of 10 plates, 100x100 mm.

6261 **Paper for chromatography**
Pack of 100 pieces. 110x140 mm sheets

PERIODIC TABLE OF ELEMENTS

6300

6300 **Periodic table**
Updated periodic table, laminated and fitted with support bars. The main physical and chemical features of every element are mentioned, essential for every laboratory. A graphic illustrates the energetic level of the orbitals which determines the sequence of the periodic table's blocks.
It is very interesting to notice the mathematically correct represantation of the orbitals s, p, d and f. Even the recent chemical elements are present. The numerical data are updated according to the 2001 IUPAC recommendations.
Size 100x70 cm.

6301 **Periodic table for students**
Periodic table, graphically the same as code 6300, but with A3 (42x29,7 cm) format.
This model is not fitted with support bars.

5716 **Atomic model**

This model helps the students to understand the atom, because it permits to create different atoms using coloured spheres which represent the protons, the neutrons and the electrons. The holes on the plate are ordered according to the different energetic levels of the orbit. In this way it is possible to understand the chemical links, the isotopes, the emission spectra and other matters concerning the atom.
Size:475x475 mm. Fitted with english instruction guide.

MM003 **Organic chemistry (teachers)**

In order to compose organic compunds' structures such as alcohols esters, alkalis, amino acids, sugars, etc. The pack constis of: 40 hydrogen atoms, 24 carbon atoms, 12 oxygen atoms, 4 nitrogen atoms,
8 halogen atoms, 8 sulphur atoms, 4 metal atoms, 55 bridges for simple connection, 25 bridges for double and triple connection, 60 caps for connections

MM051 **Organic chemistry (students)**

Suitable for groups of students. The pack consists of: 28 hydrogen atoms, 4 carbon atoms, 4 nitrogen atoms, 6 oxygen atoms, 8 chlorine atoms, 2 bromine atoms, 2 iodine atoms, 2 metal atoms, 40 bridges for simple connection, 50 bridges for double and triple connection.

MM004 **Organic and inorganic chemistry**

Fitted with organic and inorganic molecules, complex ions and covalent hydrogen.
The package consists of: 14 metal atoms, 14 hydrogen atoms, 8 halogen atoms, 22 oxygen atoms, 13 sulphur atoms, 10 nitrogen atoms, 12 carbon, 7 phosphorus, 38 medium bridges, 50 bridges for simple connection, 38 bridges for double and triple connection

7041 **Organic and inorganic chemistry**

The different components of this set permit to create a wide range of inorganic and organic compounds' molecules and crystalline structures.
The size of the components permits both the teacher to use them for desk demonstration and the students to perform group practical experiments.

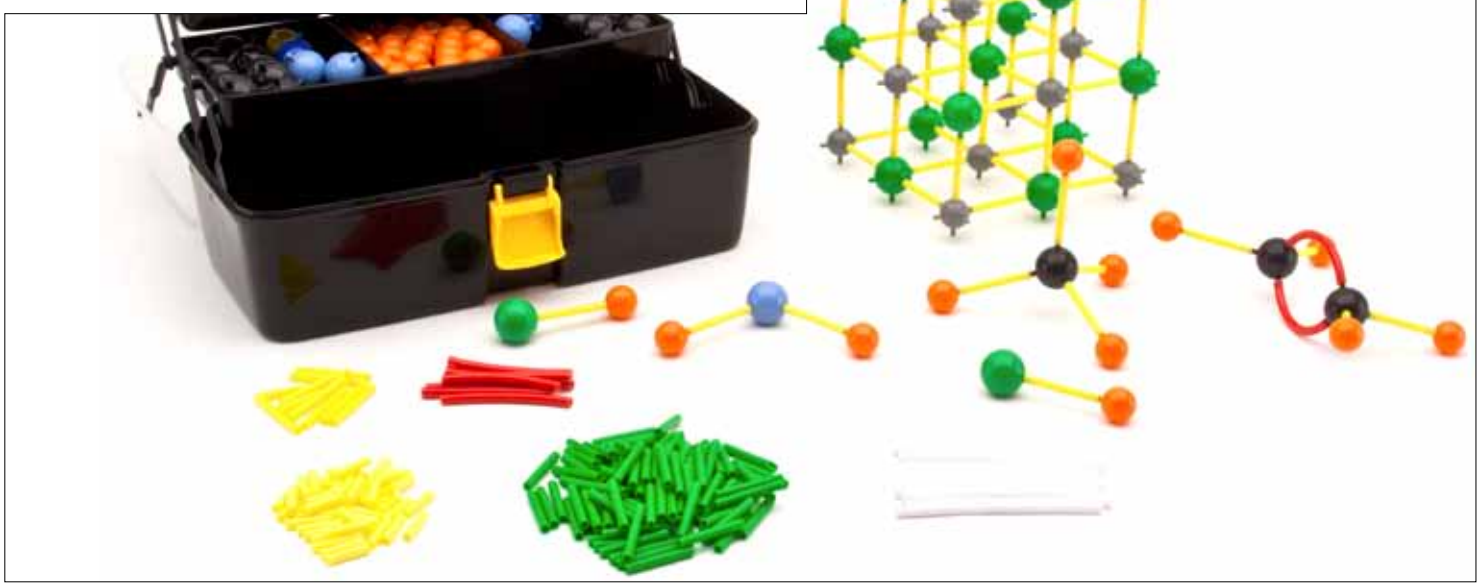
The components contained in a wooden box are as follows:

5716

MM003

MM051

7041



ATOMI

N.	Descrip.	Connections	Angles	(mm)	Colour
50	Carbon	4	109°	30	Black
48	Carbon	5	120°,90°	30	Black
40	Hydrogen	1		23	Orange
14	Sodium	6	90°	23	Grey
13	Chlorine	6	90°	30	Green
4	Oxygen	2	105°	30	Sky-blu
2	Nitrogen	4	109°	30	Blue
2	Chloride	1		30	Green
1	Sulphur	2	90°	30	Yellow

CONNECTIONS

N.	Shape	Length. (mm)	Colour
100	Linear	40	Green
75	Linear	50	Yellow
40	Linear	25	Yellow
10	Linear	120	White
10	Curve	80	Red

PHMETERS


PH-2


HI98128


PH-3


PH-5


HI8033


PH-4


HR-120


HR-150


2WAJ

8083 **Spare solution for the preservation of pH sensor probe**
Packaging of 500ml.

PH-2 **Pocket pH meter**
Measuring range: 0-14 pH. Resolution: 0,01 pH.
Built-in electrode.

PH-3 **Portable pH meter**
Measuring range: 0-14 pH. Resolution: 0,01 pH.
Electrode included.

HI98128 **Portable pH meter with thermometer**
Measuring range: 0-14 pH. Resolution: 0,01 pH.
Temperature: 0,0°C - 60,0°C. Built-in electrode included

PH-4 **Portable pHmeter-thermometer with measuring device for redox potential (ORP)**
Measuring range:
pH: 0-14. Resolution: 0,01 pH.
Temperature: 0-100°C. Resolution: 0,1°C.
ORP: from -1999 to 1999 mV. Resolution: 1mV.
Supplied with: pH/mV electrode, temperature probe and 2 single-dose sachets with buffer solutions for pH 4,01 and 7,01 calibrations.

PH-5 **Bench pHmeter-thermometer**
Measuring range:
pH: 2-16. Resolution: 0,01 pH.
Temperature: 20-120°C. Resolution 0,1°C.
ORP: from -1999 to 1999 mV. Resolution 1mV.
Supplied with: pH/mV electrode and temperature probe
Holder for electrodes. Adapter and calibration solution

Buffer solutions for calibration of pH meters

HI7004L **Buffer solution: pH 4,01, 500 ml.**
HI7007L **Buffer solution: pH 7,01, 500 ml.**
HI7010L **Buffer solution: pH 10,01, 500 ml.**

HI8033 **Portable conductivity meter**
Very practical item for measuring by using three different scales of conductivity: from 0,0 to 199,9 µS/cm; from 0 to1999 µS/cm and from 0,00 to 19,99 mS/cm.
It is fitted with TDS scale (Total Dissolved Solids), from 0 to 19990 mg/l CaCO3.
Fitted with conductivity probe.

Solutions for the calibration of the conductivity meter
HI7030M 12,880 µS/cm; 230 ml.
HI7035M 111,800 µS/cm; 230 ml.

HI7061M **Cleaning solution for pH meters' electrodes**
A 230 ml bottle for the cleaning of electrodes' joint, at least once a week, in order to prevent stoppings and preserve the precision.

REFRACTOMETRY

The operation mode of refractometers is based on the principle that the refractive index of a solution is proportional to the concentration of a solute. Thanks few drops of the sample it is easy to define the concentration of the substances. This simple and accurate method is usually used to measure the concentration of sugar solutions (Brix). The refractometers are also used in food field for products such as maramalades, fruit juices, syrups, wine, honey and so on.

HR-120 **Portable refractometer**
0-32% Brix, precision ±0,2%, division 0,2%.

HR-150 **Portable refractometer**
0-50% / 50-80% precision ±1%, division 1%.

2WAJ **Abbe bench refractometer**
Main prism: horizontal.
Secondary prism: hinge mounted.
Refraction index range: n_D 1,300 - 1,700.
Precision: n_D ±0,0003.
Division: n_D 0,0005.
Sugar range: 0-95% da n_D 1,300 - 1,530.
Precision: 0-50% = 0,2%; 51-95% = 0,1%.
Division: 0,25%.
Weight: 4 Kg.
Size: 140x100x235 mm.

POLARIMETRY

POL-1 **Bench polarimeter**
Used for measuring the concentration of optically active substances(for example sugars) in a solution.
With monochromatic light source (sodium lamp, 589,3 nm).
Measuring range: ±180°.
Precision: 0,05%.
Division: 1°.
Magnification: 3x.
Eyepiece: with time focusing.
Stabilization time: approximately 5 min.
Polarimetric tubes: 100 mm and 200 mm.
Size: 510x135x380 mm.
Power supply: 220/240V 50Hz, 30W.

POL-1

SPECTROSCOPY

CL45240 **Bench spectrophotometer**
Universal item which permits, through a physical analysis, to check the presence and concentration of the ions in a solution. Knowing the radiation wavelength of an element and selecting the instrument according to this value you can obtain the measurement of the intensity of the radiation absorbed and transmitted by the own element in correspondence to the wavelength. Depending on this measurement, the instrument is able to offer the ions' concentration directly.
Supplied with: experiments teaching guide with charts mentioning the wavelength of elements' radiation.

Technical features:
Possible measures: absorbance (A), transmittance (%T), concentration (C).
Bandwidth: 20 nm. Accuracy: -2,5...+2,5 nm.
Wavelength measuring range: from 340 to 900 nm. Reproducibility:
1 nm. Photometric linearity: 1 nm. Photometric range: 0-100%T, 0-1,999A, 0-199C.
Photometric stability: 1%T/hour.

CL45240

4126 **Pocket spectroscope**
Used to analyse the emission and the absorption of spectral radiation. Model with direct vision of the spectrum's image

4126

EMX155 **Didactic spectroscope**
Semiprofessional model with Amici prism, with adjustable opening.
Fitted with cuvettes-holder for the analysis of absorption spectra.
An adjustable mirror allows to project a reference spectrum in the eyepiece's field.

EMX155

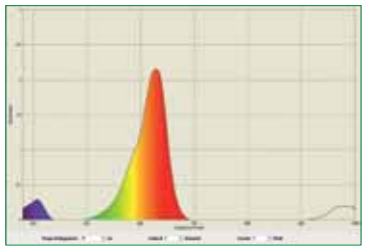
4028 **Kirchhoff-Bunsen spectroscope**
Mounted on a circular metallic base, it consits of: 1 collector with adjustable opening, 1 collector with eyepiece e cross grid, 1 collimator with graduated scale.
The opening of the collimator is fitted with a small prism that permits to compare the spectra of two different sources. While the collimator, fitted with achromatic objective (28 mm) is fixed on the base, the collector fitted with the same objective can rotate on an alidade keeping its direction axis in the middle. The collimator is orientable too and it projects the image of the graduated scale in the eyepiece of the collector through the reflection on a face of the prism.
The latter is an equilateral prism made from highly dispersive material and mounted on a central rotating disc. Fitted with operation sheets.

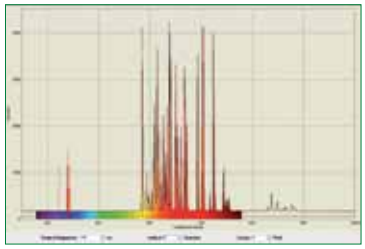
4028

4209 **Spectrometer**
Very good quality instrument both for the optics and for the mechanics. It permits to measure precisely the deviation angles of the optical rays, it allows to define the refraction index of solid and liquid substances and the wavelength of monochromatic sources.
Base: made of fire -painted cast iron, Ø 17,5 cm and divided in 360° with precision: 1°.
Equipped with two vernier which are diametrically opposed and permit to value 1/10O.
Telescope: fitted with achromatic objective with focal length of 178 mm and with a 15x ey piece.
Fitted with fine focusing.
Collimator: fitted with achromatic objective with focal length of 178 mm and adjustable opening with continuity up to 6 mm.
Plane of the prism: Vertically and horizontally adjustable, equipped with small clamps for fixing the grid diffraction. Diameter: 80 mm.
Supplied accessories: 1 Flint equilateral glass prism: 30x30 mm; 1 diffraction grid: 500 lines/mm; 1 magnification lens.
Size: 48x33x33h cm. Weight: 12 Kg.

4209

SPECTROSCOPY





A truly innovative tool for spectroscopic analysis which can perform, with the same accuracy and reliability, all the operations made by traditional and sophisticated bench spectrophotometers, but with a much superior speed, simplicity and efficiency. In fact, with the AMADEUS or RED TIDE spectrophotometer, you can immediately see the entire spectrum of the absorbance or transmittance curve, without having to manually set the individual wavelengths. A refined software allows to obtain the coordinates (intensity - wavelength) for each point of the curve, with a resolution between two consecutive peaks of only 2 nm! The standard mode measures the intensity; on the Y-axis the photons that affect the pixels of the CCD matrix are counted during the exposure time of each pixel to the light (100 ms).

OPERATING PRINCIPLE

The light signal is brought in through a slit with a diameter of 50 microns and then returned and dispersed, through a system of multiple reflective mirrors, on a CCD matrix grid that contains hundreds of small sensors aligned so that each matrix sensor controls a wavelength. The number of photons hitting each sensor is converted into a voltage signal, which in turn is converted into an intensity value on the Y-axis.

VERSATILITY

The device is suited for a variety of applications both in physics and in chemistry and is very useful in ecology for the recognition and quantification of dissolved substances. The software allows, among other applications, to fill the space beneath the curve with the corresponding colours of the visible spectrum between 380 and 780 nm, and to detect the presence of particular substances at the transmittance and/or absorption peaks.

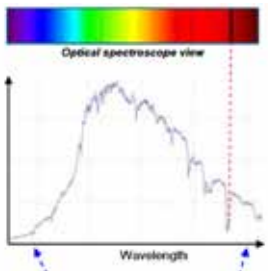
HOW TO USE IT: in the AMADEUS model an optical fibre connector located on the bottom is used for absorbance measurement, and one placed sideways for fluorescence measurements. In the RED TIDE model these measurements are carried out directly by exposure to the light source.

APPLICATIONS IN PHYSICS:

Analysis of the solar spectrum
Analysis of the black body spectrum and the Planck curve
Analysis of optical filters and interferential film
Fluorescence and Stokes' law
Reflection of light from coloured surfaces
Analysis of spectral sources (e.g. hydrogen spectrum and Balmer series)
Flames analysis
Comparison between LED and laser emission

APPLICATIONS IN CHEMISTRY - BIOLOGY - ECOLOGY:

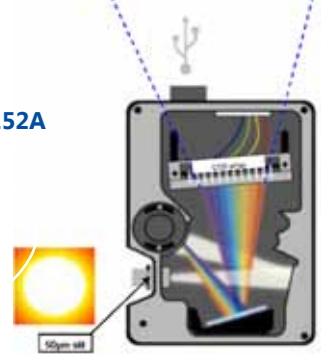
Recognition of substances
Experiments with the flame
Absorbance and transmittance curves
Beer's law by means of potassium permanganate
Measurement of the acid dissociation constant (pKa)
Spectrophotometric analysis of aspirin
Determination of the equilibrium constant
Tests on air quality



4152 Spectrophotometer RED TIDE

This model is particularly suited when high accuracy is required.
It is powered directly via a USB connection to the PC. For absorbance and transmittance analysis, the cuvette slot is placed directly on the instrument.
RED TIDE Specifications

Size (mm)	89,1 x 63,3 x 34,4
Weight	190g
SENSOR	
Type	CCD linear silicon
Pixel	650 pixel enabled
Pixel size	14 um x 200 um
Pixel capacity	~ 62,500
Sensitivity	75 photons/count @ 400nm
OPTICAL BENCH	
Type	f/4 Czerny-Turner asymmetric crossed
Focal length	42mm inlet, 68mm outlet
Inlet opening	25um microns slit
Fibre optic connector	SMA 905
Wavelengths Range USB-650 USB-650-VIS-NIR USB-650-UV-VIS	350-1000nm
Optical resolution	~2.0nm FWHM
Signal-Noise Ratio	250:1 (at full intensity)
Resolution A/D	12bit
Dark noise	3,2 counts RMS
Dynamic interval	2 x 10^8; 1300:1 for a single acquisition
Integration time	from 3ms to 65s (15s typical)
Stray light	< 0,05% @ 600nm; <0,10% @ 435nm
Linearity Correction	> 99,8%
COMPUTER	
Operative systems	Windows 98/Me/2000/XP, Mac OS X and Linux with USB port
Software	Spectroscopy Software SpectraSuite

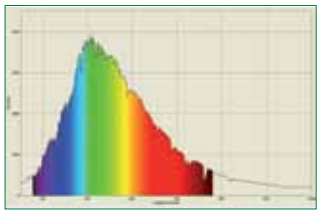


4152A Cuvette holder unit

4152B Optical fibre cable

4153 Spectrophotometer AMADEUS

Model particularly suitable for teaching purposes in Physics. Equipped with separate power supply unit and cuvette holder with two optical fibre optic connectors.
Compared to the RED TIDE, this spectrometer has a lower resolution (approximately 50%) but this feature makes the spectrometric curves "smoother" and therefore allows a more effective approach to teaching. Apart from this, the AMADEUS technical specifications are the same of the RED TIDE model.



4326 **Light source for spectroscope**
If this item is placed in front of the tube with graduated scale it will illuminate it permitting the user to read the wavelength of the spectral lines. Barrel base (cod. 0010) not included. To be used with a power supplier , 6V (cod. 5011).

4325 **Kit for observation of emission and absorption spectral lines**
It consists of a small burner in to which to place cotton wool soaked in a saturated solution of alcohol and sodium chloride (included). Observing the flame with a spectroscope it is possible to identify the emission line of the sodium at 589 nm. If a projector (cod. 4007, not included) is switched on behind the flame, it is possible to see a continuous spectrum with the absorption line of sodium.

4120 **Kit for tests to flame**
This set has been designed to allow students to practice the emission spectroscopic analysis. It consists of:

1 Portable spectroscope
1 Bottle of sodium chloride
1 Bottle of strontium chloride
1 Bottle of barium chloride
1 Bottle of potassium nitrate
1 Bottle of copper nitrate
10 Needles
1 Bottle of potassium chloride
1 Bottle of copper chloride
1 Bottle of sodium nitrate
1 Bottle of strontium nitrate
1 Bottle of barium nitrate.

4123 **Kit of spectral tubes with power unit**
This kit consists of a power unit capable to supply necessary high voltage for the discharge in the 13 analysis tubes which contain the following gases:
argo, carbonium dioxide, helium, hydrogen, mercury steam, neon, nitrogen, oxygen, air, water steam, bromine vapours, iodine steam, krypton. See on page 78.

4035 **Spectral lamps holder with power unit**
It consists of a lamp-holder fitted with two hoods, it is adjustable in height in order to obtain a perfect alignement with the collimator of the spectroscope or of the spectrogoniometer.
The tranformer is supplied.

Spectral lamps
To be used with the support cod. 4035. They represent the most suitable light source for spectroscopy.

4051 **Cadmium spectral lamp.**
4053 **Helium spectral lamp.**
4054 **Mercury spectral lamp.**
4056 **Sodium spectral lamp.**
4057 **Neon spectral lamp.**
4058 **Zinc spectral lamp.**

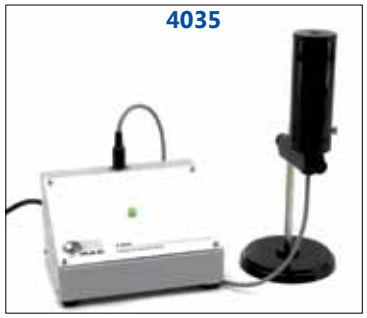
6107 **Nickel-Chrome wire for flame tests**
Glass handle.


4326


4325


Observation of an absorption spectrum


4120


4035


Spectral lamps 4035


6107

GAS LAWS

1414 **Boyle's law apparatus**
A trasparent graduated cylinder is linked with a manometer.
Acting on the piston by a screw fitted with knob, it is possible to reduce the volume of the air contained in the cylinder and in the meantime to read the value of its pressure on the manometer. Fitted with digital thermometer.

1137 **Charles' law apparatus**
Thanks to this item it is possible to check the law that regulate the variations of a gas 'volume (at costant pressure) , when its temperature varies. In this way you can measure the dilatation coefficient (at a costant pressure).
Burner, tripod and flame-scattered grid are not included.

1122 **Gay-Lussac's law apparatus**
Thanks to this item it is possible to verify the law that regulate the variations of a gas' pressure (at a costant volume), when its temperature varies.
Burner, tripod and flame-scattered grid are not included.

1217 **Gas' laws apparatus**
It consists of items cod. 1137 and cod. 1122.
Its cost is lower than the sum of their two costs, because of the common parts elimination.


1414


1137


1122

MOLECULAR ASPECT OF THE MATTER

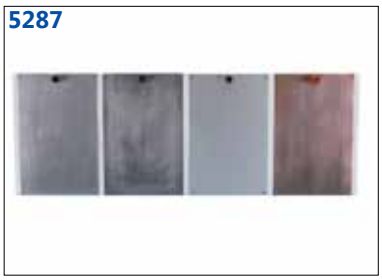
2110

HS7610

2096 on video projector

5167

5287



5124

5102

5113

5415

5251

2110 **Gas kinetic model**
Thanks to this model it is possible to simulate thermal agitation of gas' molecules according to the temperature. In the vertical cylinder there are small spheres which are agitated by a piston linked to a vibrator that works thanks to a small electric motor (3-6 V) characterized by adjustable speed.

HS7610 **Radiometer**
When the swirl is exposed to a light sources it begins to turn. If the radiation is more intense the speed is greater. This because when the gas' molecules in the cruet are in touch with the black faces of the small paddles, which are warmer of the white ones due to their higher absorption power, they rebound in a quicker way and they give an higher impulse than the one given by white faces. . This is the reason of the swirl rotation.

2096 **Air cushion table for the study of molecular motions**
The functioning of this item is based on the same principle of the cushion rail. This model of the table (35x35 cm) presents the following advantages:
- an increased visibility due to its transparent plate. It can be placed on an overhead projector;
- the shocks of moving bodies are not mechanical but magnetic, thus the energy is very low.
This air cushion table permits to reproduce many phenomena regarding the following physical processes:

1. Molecular structure of the matter
2. Changes of state
3. Gases' kinetic theory
4. Statitical aspects
5. Molecular energy and temperature
6. Molecular diffusion
7. Density distribution
8. Browniam motion
9. Thermal conductivity of solids
10. Electrical conductivity in metals
11. Electrical conductivity in semiconductors
12. Rutherford's atomic model

Didactic guide includes

50 POSSIBLE EXPERIMENTS

ELECTROCHEMISTRY

5124 **Volta's battery, column type**
It consists of zinc and copper parts, divided by small felt discs soaked in an acid solution. Fitted with a bottle of acid solution.

5167 **Volta's battery, cups type**
It consists of four serial voltmeters. It is supplied with copper and zinc electrodes, acid solution, cables and a LED mounted on a panel.

5287 **Human battery**
Putting the hands on two of the four metallic plates (zinc, lead, aluminum und copper), will generate a difference of potential between the plates due to electrical conductivity of human body. This difference in potential can be measured by a millivoltmeter (not supplied). Trying the different combinations among metals, it is possible to perceive the existence of the electrochemical series.
Plates size: 15x23 cm. Table size: 23x65 cm.

5113 **Apparatus for electrical conductivity in liquids**
It consists of 4 parallel bulbs. Electrolytic liquids are to be poured in the four glass beakers, in which the electrodes are located. Thanks to this simple item it is possible to recognize the solutions of electrolytes and study the variations depending on concentration.

5415 **Electrolytic cell**
COMPONENTS:
1 Small stage with electrodes-holder support
1 Glass beaker, (400 ml, with stage)
1 Iron electrode
2 coal electrodes
2 Copper electrodes
2 cables
2 Zinc electrodes
2 lead electrodes
1 Sulphuric acid bottle, 10% solution
1 Bottle of copper sulphate's solution

POSSIBLE EXPERIMENTS:
- Electrical conductivity in liquids
- Volta's battery
- Electricity accumulator
- Electroplating

5415.1 **Kit of spare electrodes for cod. 5415**

Hofmann's voltameters
For checking of Faraday's laws. With graduated tubes and fitted with metallic support. Height: 70 cm.

5102 **With coal electrodes.**
Total capacity: 100 ml

5103 **With platinum electrodes.**

Spare parts for Hofmann's voltameter

5102.1 **Only glass made part.**
5165 **Carbon electrodes (pair).**
5166 **Platinum electrodes (pair).**

5251 **Voltameter for demonstration**
Not graduated tubes, closed with rubbber plugs and Mohr pincers.
Fitted with support ed coal electrodes. Height of the glass part: 35 cm.
Total capaity: 60 ml