Photometers

Complete, Portable Custom Laboratories

HANNA instruments®' Ion Specific Meters have resolved the problems of easy, on site measurements the concentration of parameters such as chlorine, ammonia and copper. These portable instruments are dedicated to a specific ion and unlike conventional spectrophotometers and Ion Selective Electrodes, are fast and simple to use. You have none of the problems associated with Ion Selective Electrodes such as preparation time, expensive additives, temperature compensation or slow response time! The HANNA instruments® Ion Specific Meter uses a state-of-the-art custom microprocessor with a diode photocell to detect a single parameter. The readings are shown in large digits on a clear LCD. No need to worry about matching up colors or guessing where one color zone starts and the other finishes as with chemical test kits or test strips. Quick, simple and precise!

Lightweight and Portable

The casings of HANNA instruments®' portable line of Ion Specific Meters are specifically engineered to perfectly fit the palm of your hand. Weighing less than 300 grams (11 ounces), these portable meters are ideal for spot-checks at landfills, streambeds, water sources or inside any lab!

HANNA instruments®' compact bench photometers weigh only 700 grams and measure 23 x 17 x 7 cm so that they can be easily transported.

Long Battery Life

With a battery life lasting a minimum of 300 tests and an auto-shut off feature, you are guaranteed long periods of trouble-free operation. No surprises with these meters: the display will give you a low battery warning and a few extra measurements before new batteries are necessary. If needed, you can also plug in the bench meters for extended use.

Quick and Simple-to-Use

All you need to do to operate these meters is zero your sample, dissolve a readily soluble powder or add a few drops of a reagent in the cuvet and take a reading. A cuvet cap is supplied with the meter to prevent outside light from interfering with measurements.

Tests Made Inexpensive

Each HANNA instruments® meter comes supplied complete with cuvets in attractive packaging. A wide selection of inexpensive reagents for 100 or 300 tests further reduces your cost-per-test. The meters will in fact cost less than the several test kits needed to cover the same range!

Aquaculture

Swimming Pools

Water Quality Control

Method of Analysis

Principle of Operation

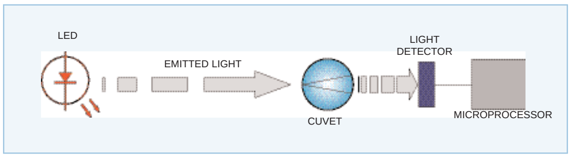
The color of every object we see is determined by a process of absorption and emission of the electromagnetic radiation (light) of its molecules. Photometric analysis is based on the principle that many substances react with each other and form a color which can indicate the concentration of the substance to be measured. When a substance is exposed to a beam of light of intensity I_0 a portion of the radiation is absorbed by the substance's molecules, and a radiation of intensity I lower than I_0 is emitted.

The quantity of radiation absorbed is given by the Lambert-Beer Law: $A = \log I_0 / I$

Absorbance is also given by: $A = \varepsilon_\lambda \, c \, d$

where ε_λ molar extinction coefficient of the substance at wavelength λ;
c molar concentration of the substance;
d optical distance light travels through sample;

Therefore, the concentration (c) can be calculated from the color of the substance determined by the emitted radiation (I), as the other factors are known.
A typical block diagram of a photometer is shown below:



A monochromatic LED (Light Emitting Diode) emits radiation at a single wavelength, supplying the system with the intensity (I_0). Since a substance absorbs the color complimentary to the one it emits (for example, a substance appears yellow because it absorbs blue light), HANNA instruments® photometers use LEDs that emit the appropriate wavelength to measure the sample. The optical distance is measured by the dimension of the cuvet containing the sample. The photoelectric cell collects the radiation (I) emitted by the sample and converts it into an electric current, producing a potential in the mV range. The microprocessor uses this potential to convert the incoming value into the desired measuring unit and to display it on the LCD. In fact, the preparation of the solution to be measured occurs under known conditions, which are programmed into the meter's microprocessor in the form of a calibration curve. This curve is used as a reference for each measurement. It is then possible to dose unknown concentrations of the sample and induce a colorimetric reaction, and thus obtain the mV related to the emitted intensity (I) (the color of the sample). By employing the calibration curve, one can determine the concentration of the sample that corresponds to the mV value. The measurement process is done in two phases: setting the meter to zero, and then the actual measurement. The first phase consists of collecting a sample of the substance in the calibration cuvet and inserting it in the meter. In this way, a reference value is set up, so that it is possible to establish how much the color of the substance has varied in the next phase, after treating the sample in the measuring cuvet with a reagent. The cuvet has a very important role because it is an optical element, and thus requires careful attention. First of all, it is important that both the measurement and the calibration cuvets are optically identical to provide the same measurement conditions. It is also necessary that the cuvet's surface is clean and not scratched, in order to avoid measurement interference due to unwanted reflection and absorption of light.

Laboratory