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Measuring phosphate with an inexpensive, easy to build photometer

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In the context of a course for first year students to get hands-on experience with measuring in the environment, a photometric system for measuring phosphate concentration was developed. The system makes use of a single LED as a light source, a Si photodiode-based light to frequency conversion IC and an Arduino electronic card as acquisition system. The instrument is designed as an easy to assemble system and assembling and alignment is part of the exercise. The phosphate measurement is based on the formation of phosphor-molybdate complex which is eventually reduced to a blue component. The absorbance at 710 nm of a phosphate-containing fluid with added indicator is then measured and calibrated with a known solution. The initial test has demonstrated the ability of the instrument to detect phosphates in tap water. Other components as nitrates or chlorophyll could be easily measured with the instrument using LED emitting at the respective wavelengths.