

# UNIVERSITY OF LOUISIANA AT LAFAYETTE

STEP Committee

Technology Fee Application

Implementing MILLIQ IQ 7000 V2 Nano-pure Water  
System Technique  
in Chemistry Labs

Title

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Name of Submitter

*(Faculty or Staff Only)*

**UL Lafayette Department of Chemistry**

Organization

Title: Implementing MILLIQ IQ 7000 V2 Nano-pure Water System Technique in Chemistry Labs

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Department/College/Org: Department of Chemistry

### **ABSTRACT (250 words or less):**

This proposal is devoted to upgrade **the undergraduate Analytical Chemistry lab CHEM 222 (taught 3 semesters/year), Instrumental Analysis lab CHEM 430G, inorganic chemistry CHEM 252 (taught twice a year) and 452G Advanced inorganic chemistry (one semester)**. It will allow the graduate students to expand their research and perform more experiments. In the last few years we upgraded the lab manuals for these courses and introduced new microscale experiments as demanded by the ACS, to minimize the amount of chemicals used. In a continuous effort to improve our students' skills and enhance their capabilities for quantitative analysis, we submit this proposal to purchase a **MilliQ IQ 7000 V2 Nano-pure water system (\$13,290)**. This apparatus is widely used in industry, medicinal and pharmaceutical companies as well as in research, environmental, biochemical, and material science laboratories. This advanced instrument will be used for several projects aimed at characterizing and determine heavy toxic metals in food, water quality, environmental, and drug industry samples. Due to the variety of applications students would use it in many chemistry laboratories to detect and quantify very small amounts even traces of metal pollutants in a wide variety of samples. It will be used also to quantify the metal concentrations in synthesized compounds used as anticancer, in DNA cleavage and catalysts. This instrument coupled with ICP will enhance students' accuracy by measuring traces of pollutants. The instrument is reliable, easy to handle and can be used in organic chemistry (**CHEM 332/334, over 300 students/year**) and biochemistry (**CHEM 319**) laboratories.

## 1. Purpose of grant and impact to student body as a whole

This application is to request funding the purchase of **MilliQ IQ 7000 V2 Nano-pure water system** which will be coupled with ICP (Inductively Coupled Plasma purchased in 2018) for qualitative and quantitative determination of toxic heavy metals. These metals can be detected using this instrument in part per billion concentration (traces). The presence of these metals in food, drinks, drugs, and everyday used products is very crucial. These metals target the nervous system, brain and spinal cord causing serious health problems and might lead to death. Monitoring the concentrations of these types of pollutants in wide variety of samples is very critical and students must learn how to use this technique future careers.

The Department of Chemistry is aiming to replace macroscale experiments by microscale ones. Microscale is designed toward cleaner, more economical chemistry and minimizing the sample preparation as well as reducing the amount of waste materials. However, microscale requires using more advanced instruments that can detect very low concentrations such as MilliQ IQ 7000 V2 Nano-pure water system which will be coupled with ICP. It also requires good training and skills that students need to learn in order to handle small amount of materials and measure traces of chemicals which is essential in preparing them for their professional career.

In contrast to most existing techniques, which are designed for research, the requested system is ideally suited for both teaching and research. Positive funding decision will enable us to deploy the requested equipment for students use in CHEM 222 (Analytical Chemistry Lab approx. 40-45 students/year). Students will use it to determine heavy metals in water samples from different sources. CHEM 430G (Instrumental Analysis a Lecture and Lab course required by American Chemical Society certified chemistry major students approx. 8-15 students/year). Students in this class can use it in Determination of Lead, mercury, and cadmium in different samples such as tap water, swamp water, baby food, juices, cosmetic products and paint. In inorganic chemistry CHEM 252 (taught twice a year), students will determine different elements in synthesized complexes. In 452G Advanced inorganic chemistry (one semester), students will quantify the metal concentrations in synthesized compounds used as anticancer, in DNA cleavage or catalysts. A Biochemistry experiment that can be taught for CHEM 319 (Biochemistry Lab, ~ 14 students/year) characterization of metals in biological samples.

The instrument will be introduced to the NEW Graduate Earth & Energy Sciences Ph.D. program (starting Fall 2019) to enhance instrumental capabilities as well as research

activities in the Department of Chemistry. This system will be used in faculty research, undergraduate research (CHEM 362 and 462) in addition to undergraduate teaching.

Therefore, we strongly feel that it's important for our students to acquire hands-on training in this system. The new technique also allows faster and simultaneous measurements of several metals in one sample by coupling the requested system to ICP, thereby accommodating rapidly increasing enrollments in our laboratories. In summary, the requested system will synergistically allow the determination of toxic metals in the environment. In addition, it will enhance the graduate and undergraduate teaching and research. These projects expose students to real scientific investigations through project-based experiments. Additionally, it will encourage the collaborative activities on and off campus and will improve the potential for attracting more research grants.

## **2. Projected lifetime of enhancement**

The requested fund will pay for new MilliQ IQ 7000 V2 Nano-pure water system, with a life expectancy 6-10 years. The requested system ships within 3 months - 9 months with factory warranty. This instrument is simple, and it can be used easily by students. No regular maintenance is anticipated for this instrument other than changing the filter and keeping the working area around it clean.

## **3. Person(s) responsible for:**

i. **Implementation:** Dr. Febee Louka and Dr. Hui Yan

ii. **Installation:** By the vendor

iii. **Maintenance:** There is no regular maintenance anticipated. If a component fails, Dr. Thomas Junk, Department Head, will make arrangements for repairs and changing the filters from departmental funds.

iv. **Operation:** is easy to be operated by students under the supervision of faculty members teaching the labs.

v. **Training:** This should be provided by instructor teaching each laboratory.

## Budget Proposal

	<u>Unit</u>	<u># Requested</u>	<u>Total</u>
1. ZIQ7000T0 (The MILLI-Q. IQ 7000 Nano-pure Water Purification)	\$7,661.00	1	\$7,660.00
2. ZIQP0D000 (Q-POD. REMOTE DISPENSER)	\$2,070.00	1	\$2,070.00
3. IPAKMETA1 (IPAK META. POLISHING CARTRIDGE)	\$590.00	2	\$1,180.00
4. IPAKQUAA1 (IPAK QUANTA. POLISHING CARTRID)	\$590.00	2	\$1,180.00
3. Software	Included	0	\$0.00
4. Supplies and shipping	\$2000.00	1	\$1,200.00
5. Maintenance	\$ 0.00	0	\$0.00
6. Personnel	\$ 0.00	0	\$0.00
<b>TOTAL:</b>			<b>\$13,290.00</b>

### 4. Budget Narrative

#### ***Equipment***

**\$7,660.00**

The Milli-Q. IQ 7000 nano-pure water purification sold as a kit including all parts.

#### ***Q-POD. REMOTE DISPENSER***

**\$2,070.00**

Used to dispense the nano-pure water and avoid its contamination.

#### ***IPAK META. POLISHING CARTRIDGE***

**\$1,180.00**

#### ***IPAK Quanta. POLISHING CARTRIDGE***

**\$1,180.00**

Two sizes of polishing cartridges to ensure obtaining the highest quality of nano-pure water.

#### ***Supplies and shipping:***

**\$1,200.00**

Different diameters and length tubing

Heavy metals standards

***Maintenance:*** \$0.00

***Personnel:*** \$0.00