Appendix 12b

REPORT

of dissertation for the acquisition of:

educational and scientific degree " **doctor** "	X
scientific degree **"Doctor of Science"**	
	the true is indicated by the sign "X"

Author of the dissertation:

		Eduard	Lyudmilov	Stefanov	UCTM, Sofia
academic position	scientific degree	name	middle name	last name	workplace

Topic of the dissertation:

Speciation Analysis of Arsenic in Copper Electrolyte, Waters and Soils

Scientific area:

4.	Natural Sciences, Mathematics and Informatics
code	name

Professional area:

4.2.	Chemical Sciences
code	name

Scientific specialty:

Analytical Chemistry

The report was written by:

Assoc. Prof.	PhD	Meglena	Ilieva	Kandinska-Vasileva	Sofia University “St. Kliment Ohridski”
academic position	scientific degree	name	middle name	last name	workplace

1. Meeting the minimum requirements under the Regulations:

A) The candidate meets the minimum requirements	20 points	X
B) The candidate doesn’t meet the minimum requirements	0 points	
		one of the answers given is marked with the sign "X"

It is mandatory to fill in if answer B is marked. The publication activity of the candidate is analyzed. The response of the results achieved (quoted) is analyzed.
There is one, related to the thesis, out-of-print publication in a peer-reviewed and indexed journal with an impact factor (IF) and a Q4 category (12 p.); one out-of-print publication in a peer-reviewed and indexed

journal with SJR (10 p.), cited once; one out-of-print publication in an unrefereed journal in world-renowned scientific databases. One, accepted for publication, publication in a refereed and indexed journal in world-renowned databases with an impact factor (IF) and Q3 category for 2023 is also attached to the thesis, but there is no evidence of acceptance.

2. The relevance of the topic of the dissertation:

A) The topic is relevant and new (there are no known results on the topic by other authors)	8 points	
B) The topic is relevant and results from other authors are known	6 points	X
C) The topic is not relevant, but results from other authors are known	2 points	
D) The topic is not relevant and no results from other authors are known	1 point	
E) The topic does not correspond to the level of dissertation	0 points	
		one of the answers given is marked with the sign "X"

The evaluation of the relevance of the dissertation must be substantiated
The dissertation submitted for my opinion is in a topical direction, closely related to the current trends for the development of completely waste-free production technologies or those that guarantee the release of minimal amounts of pollutants, including arsenic. The literature review carried out by Eduard Stefanov convinces of the relevance, importance and applicability of his planned research. The literature review is competently written and based on a solid bibliographic reference, which leaves no doubt that PhD student Stefanov is familiar with the state of the art. A large volume of scientific information has been processed, which has allowed the precise and clear formulation of the dissertation's objectives and the appropriate selection of specific tasks for their successful implementation.

3. Type of research:

A) Theoretical	4 points	
B) Applied	4 points	
C) Theoretical with application elements	4 points	X
D) It does not correspond to the level of dissertation	0 points	
		one of the answers given is marked with the sign "X"

The level of research must be substantiated if answer D is marked.

4. Objectives of the research:

A) Realistic and of scientific and / or applied interest	8 points	X
B) Realistic, but not of scientific and / or applied interest	3 points	
C) Unattainable (unrealistic)	0 points	

		one of the answers given is marked with the sign "X"

Objectives must be specified. The type of the set objectives must be justified.
The objectives set in the thesis are fully achievable and significant both from a fundamental and applied point of view, namely – the development of inexpensive, affordable and applicable to industrial practice methods for the determination of arsenic forms in contaminated samples. The specific tasks formulated to fulfil the outlined objectives are well justified following the thorough review of strategies for the analysis of arsenic inorganic forms, made in the literature review, and the conclusions defined thereafter.

5. Contributions of the dissertation:

A) With lasting scientific and / or applied response, they form the basis for new research and applications	20 points	X
B) They are of significant scientific and / or applied interest, complete and / or summarize previous research	16 points	
C) They are of scientific and / or applied interest	12 points	
D) Lack of significant contributions	8 points	
E) Lack of contributions	0 points	
		one of the answers given is marked with the sign "X"

Contributions must be specified. The type of results achieved must be justified.
In the course of developing the thesis, a considerable amount of experimental and analytical work has been carried out at a high scientific level, which is described clearly and systematically, and is supported by a large amount of evidential and illustrative material. As a result of the doctoral student's achievements, the following contributions of his dissertation can be manifested: 1. Four accurate and precise methods have been developed for the speciation analysis of inorganic forms of arsenic in samples with different matrix compositions: ●ICP-OES method combined with liquid-liquid extraction for simultaneous determination of the both inorganic forms of arsenic in copper electrolyte; ●ICP-MS method with liquid-liquid extraction for the determination of the inorganic forms of arsenic in waste water; ●ICP-MS method in combination MW dilution followed by liquid-liquid extraction for the determination of arsenic forms in contaminated soils. ● innovative and green ion chromatographic method with conductometric detection for a direct determination of As(V) and total arsenic, allowing indirect determination of As(III). 2. The first two methods have been successfully implemented at Aurubis Bulgaria and have contributed to improving the quality of the cathode copper produced, to reducing the cost of wastewater treatment, and to more accurately characterizing the As(III) and As(V) content of the input industrial water stream. 3. On the basis of a proposed approach for the treatment of arsenic wastewater by precipitation in the form of scorodite, the reconstruction of the industrial water treatment plant in the same enterprise was designed and initiated, which is a guarantee for the sustainable development of the region.

6. Conclusion

A) The evaluation of the dissertation is **POSITIVE**	This evaluation is assigned to a total number of at least 40 points	X
B) The evaluation of the dissertation is **NEGATIVE**	This evaluation is assigned to a total number below 40 points	

		one of the answers given is marked with the sign "X"

To be filled in at the request of the member of the scientific jury
The dissertation of Eduard Stefanov and the investigations carried out fully meet the generally accepted standards and correspond to all the requirements of Act for the Development of the Academic Staff in the Republic of Bulgaria (ADASRB), the Regulations for the Implementation of ADASRB, the Regulations for the Implementation of ADASRB of UCTM for the professional area of Chemical Sciences. The work includes research on scientific topics of applied nature and is related to the development of analytical methods for the determination of arsenic forms in contaminated samples such as copper electrolyte, wastewater from metallurgical industries and soils. Original scientific results and contributions are presented. Some of them have already been implemented in the practice of the copper mining plant Aurubis Bulgaria. The volume and quality of the work meet generally accepted standards. I believe that the PhD student possesses the necessary training, skills and qualities for independent scientific research. Due to the above mentioned, I confidently give my positive assessment of the conducted research and the PhD Thesis, recommending the Scientific Jury to award the educational and scientific degree "Doctor" to Eng. Eduard Lyudmilov Stefanov in Professional area 4.2. Chemical Sciences (Analytical Chemistry).

03.06.2024	The report was written by:	
date		signature