



University of Sadat City  
Genetic Engineering and  
Biotechnology Research Institute.  
Quality Assurance Unit



جامعة مدينة السادات  
معهد بحوث الهندسة الوراثية والتكنولوجيا الحيوية  
وحدة ضمان الجودة

***Industrial Biotechnology***  
***Doctorate Program***  
***(2015-2016)***  
**Approved on 20/9/2010**



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## **National authority of quality assurance and accreditation of education (NAQAAE) for postgraduate studies:**

### ***1- Attributes of the graduate***

#### **1-The graduate of Doctorate program must to able to:**

- 1.1. Master basics and methodologies of scientific research.
- 1.2. Add to the knowledge in the specialization field.
- 1.3. Apply analytical and critical approach to the knowledge in specialty and related areas.
- 1.4. Merge and develop specialized knowledge with that of related subjects extrapolating bilateral ties in between.
- 1.5. Show deep consciousness of the ongoing specialty problems and theories.
- 1.6. Determine professional problems and find innovative solutions.
- 1.7. Master a wide range of professional skills in the specialty area.
- 1.8. Work towards the development of professional methods, and new tools.
- 1.9. Use appropriate technological means to serve professional practice.
- 1.10. Communicate effectively and lead work team in different professional contexts.
- 1.11. Make decisions according to available information.
- 1.12. Employ available and new resources efficiently and work on developing.
- 1.13. Be aware of the role in community development and industrial conservation.
- 1.14. Act in a manner reflecting the commitment to integrity, credibility and rules of the profession.
- 1.15. Be committed to continuous self-development and transfer knowledge and expertise to others.

#### **2- General academic standards:**

##### **2.1. Knowledge & Understanding:**

**By the end of the study of Doctorate program of any specialty, the graduate must have fluent deep knowledge & understanding of:**

- 2.1.1. Basic facts, theories and recent advances of the specialty and related subjects.
- 2.1.2. Basics, methodologies and scientific research ethics as its different tools.
- 2.1.3. Ethical and legal principles of professional practice.
- 2.1.4. Quality standards of professional practice.
- 2.1.5. Knowledge related to the professional practice impact on the industrial biotechnology development



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## 2.2. Intellectual skills:

**By the end of the Doctorate program study in any specialty, the graduate must be able to:**

- 2.2.1. Analyze, evaluate and deduce the information in the specialty fields.
- 2.2.2. Solve the specialized problems according to available data.
- 2.2.3. Conduct research studies that add to specialty knowledge.
- 2.2.4. Write and publish scientific articles.
- 2.2.5 Evaluate professional practice risks.
- 2.2.6. Plan to improve specialty performance.
- 2.2.7. Take decisions in various professional situations including dilemmas and controversial issues.
- 2.2.8. Add to the specialty field through creativity & innovation.
- 2.2.9. Manage discussions on basis of evidence and proofs.

## 2.3. Professional skills:

**By the end of Doctorate program study in any specialty, the graduate must:**

- 2.3.1. Master basic and advanced professional skills in the specialty field.
- 2.3.2. Write and appraise professional reports.
- 2.3.3. Evaluate and improve methods and tools used in the specialty.
- 2.3.4. Use technological tools to serve professional practice.
- 2.3.5. Plan for professional practice development and performance of others.

## 2.4. General & transferable skills:

**By the end of the study of Doctorate program of any specialty, the graduate must:**

- 2.4.1. Communicate effectively using different means.
- 2.4.2. Use information technology to improve professional practice.
- 2.4.3. Teach and evaluate others.
- 2.4.4. Perform self appraisal and seek continuous learning.
- 2.4.5. Use different resources to obtain information and knowledge.
- 2.4.6. Work in and lead a team.
- 2.4.7. Manage scientific meetings and time.



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### 3- Program Academic Standards:

#### 3.1 Knowledge & Understanding

**By the end of the study of doctorate students industrial biotechnology, graduate must have sufficient knowledge & understanding of:**

- 3.1.1 Basic facts, theories and recent advances of the industrial biotechnology and related subjects.
- 3.1.2 Basics , methodologies and scientific research ethics as its different tools
- 3.1.3 Ethical and legal fundamentals (research writing – supervising – authorizing – applying) and their applications on the field of industrial biotechnology.
- 3.1.4 Quality standards of professional practice in the field of industrial biotechnology.
- 3.1.5 Knowledge related to the professional practice impact on the environment development and conservation.

#### 3.2 Intellectual Skills

**By the end of the doctorate student program in industrial biotechnology specialty, the graduate must be able to:**

- 3.2.1 Analyze, evaluate and deduce the information in the field of industrial biotechnology.
- 3.2.2 Solve the specialized problems according to available data of industrial biotechnology.
- 3.2.3 Conduct research studies that add knowledge to industrial biotechnology.
- 3.2.4 Write and publish scientific articles in the field of industrial biotechnology.
- 3.2.5 Evaluate professional practice risks in industrial biotechnology.
- 3.2.6 Plan to improve specialty performance in the field of industrial



biotechnology.

3.2.7 Take decisions in various professional situations including dilemmas and controversial issues

3.2.8 Add to the specialty field through creativity & innovation.

3.2.9. Manage discussions on basis of evidence and proofs.

### **3.3. Professional skills**

**By the end of the doctorate student program in industrial biotechnology specialty, the graduate must be able to:**

3.3.1 Master basic and advanced professional skills in the field of industrial biotechnology.

3.3.2 Write and appraise professional reports about industrial biotechnology.

3.3.3 Evaluate and improve methods and tools used in the field of industrial biotechnology.

3.3.4 Use technological tools to serve professional practice.

3.3.5 Plan for professional practice development and performance of others.

### **3.4. General & Transferable skills**

**By the end of the doctorate student program in industrial biotechnology specialty, the graduate must be able to:**

3.4.1 Communicate effectively using different means.

3.4.2. Use information technology to improve professional practice.

3.4.3. Teach and evaluate others.

3.4.4. Perform self appraisal and seek continuous learning.

3.4.5. Use different resources to obtain information and knowledge.

3.4.6. Work in and lead a team.

3.4.7. Manage scientific meetings and time.



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# **Industrial Biotechnology Doctorate Program specification (2015-2016)**



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**University: University of Sadat City.**

**Institute: Genetic Engineering and Biotechnology Research Institute.**

## **Doctorate Program Specification**

(2016/2017)

### **A-Basic Information**

**1- Programme title: Doctorate in Industrial Biotechnology**

**2- Program type:                      Single                       Double                      Multiple**

**3- Department: Industrial Biotechnology**

**4- Program coordinator: Prof. Dr./ Rafaat Elsanhoty**

**5- Program Approval Date: 20 /9 /2010**

### **B- Professional Information:**

**1- Program aims:**

- a) To prepare distinguished graduates capable to apply the most recent techniques in the field of Industrial biotechnology.
- b) To develop student Industrial knowledge and skills to solve the theoretical and practical Industrial problems.
- c) To help students to acquire the skills of writing and publishing research papers in Industrial biotechnology journals and scientific conferences.
- d) To develop the student research team-work skills and setting research rules in the field of Industrial biotechnology.
- e) To enhance the students understanding of research system (input – process-output) and
- f) To be able to develop and manage new vision toward supervising scientific research projects in the field of Industrial biotechnology.



## 2- Intended learning outcomes (ILOs):

### 2/1 Knowledge and understanding:

*By the end of this program, the graduate must able to:*

- a) Clarify differences relations between basic facts & theories of industrial biotechnology and applied biology. Increase the chance to obtain the new information
- b) Explain the mutual links between topics in industrial and applied biotechnology and bioprocess analysis, submission, retrieval and comparisons.
- c) Divide the main scientific parts of applied biotechnology and bioprocess
- d) Express the fundamental of ethical and legal practice and their using in the field of biological treatment of industrial effluent and aspects of biological wastes toxicology
- e) Remolding the actual quality standards of the practical analysis and determination of industrial and applied biotechnology.
- f) Explain basics and ethics of scientific researches of industrial and applied biotechnology fields.

### 2/2 Intellectual skills:

*By the end of this program, the graduate must able to:*

- a) Evaluate various metabolites from microbial cells and maximize them.
- b) Determine Problems of the incoming demands for specific microbial products and find new sources for them .
- c) Evaluate biological industries problems and get solutions for them.
- d) Find solutions for overcoming bio based industries defects
- e) Evaluate the nutritional values of food components.
- f) Find Solutions for probable hazards and risks resulting from industrial bioproduction.





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- g) Innovate new antibiotic derivatives via biotransformation.
- h) Suggest production conditions to fit the requirements of genetically modified microorganisms and food safety
- i) Design an industrial project for production of specific biological compounds and modified equipment for use in biological production by the fermentation
- j) Distinguish the microbial characters for overproduction of specific substances.

### **2/3 Professional skills:**

*By the end of this program, the graduate must able to:*

- a- Write professional scientific reports in the field of Industrial biotechnology branches.
- b- Execute the basic and advanced professional skills in Industrial biotechnology during the experimental work in research.
- c- Select and evaluate methods and tools during the research in Industrial biotechnology.
- d- Prepare modern modules of Industrial bioprocess research.
- e- Use professional technologies for serving research and practice.

### **2/4 General and transferable skills:**

*By the end of this program, the graduate must able to:*

- a- Work in team with public, collegeous and appropriate authorities.
- b- Show management skills for using information technology to improve his/her professional practice in internet and relative information.
- c- Use different sources of information to obtain data for a given course topics.
- d- Communicate with others and manage time effectively.
- e- Show self learning abilities in situation comparable to his level.
- f- Use audio and video means for displaying information to learn independently and seek continuous learning in Industrial biotechnology research.



### 3- Program Academic Standards:

#### 3.1 Knowledge & Understanding

**By the end of the study of doctorate students industrial biotechnology, graduate must have sufficient knowledge & understanding of:**

- 3.1.1 Basic facts, theories and recent advances of the industrial biotechnology and related subjects.
- 3.1.2 Basics, methodologies and scientific research ethics as its different tools
- 3.1.3 Ethical and legal fundamentals (research writing – supervising – authorizing – applying) and their applications on the field of industrial biotechnology.
- 3.1.4 Quality standards of professional practice in the field of industrial biotechnology.
- 3.1.5 Knowledge related to the professional practice impact on the environment development and conservation.

#### 3.2 Intellectual Skills

**By the end of the doctorate student program in industrial biotechnology specialty, the graduate must be able to:**

- 3.2.1 Analyze, evaluate and deduce the information in the field of industrial biotechnology and food safety
- 3.2.2 Solve the specialized problems according to available data of industrial biotechnology.
- 3.2.3 Conduct research studies that add knowledge to industrial biotechnology.
- 3.2.4 Write and publish scientific articles in the field of industrial biotechnology.
- 3.2.5 Evaluate the professional practice risks in industrial biotechnology.
- 3.2.6 Plan to improve specialty performance in the field of industrial biotechnology.



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3.2.7 Take decisions in various professional situations including dilemmas and controversial issues

3.2.8 Add to the specialty field through creativity & innovation.

3.2.9. Manage discussions on basis of evidence and proofs.

### **3.3. Professional skills**

**By the end of the doctorate student program in industrial biotechnology specialty, the graduate must be able to:**

3.3.1 Master basic and advanced professional skills in the field of industrial biotechnology.

3.3.2 Write and appraise professional reports about industrial biotechnology.

3.3.3 Evaluate and improve methods and tools used in the field of industrial biotechnology.

3.3.4 Use technological tools to serve professional practice.

3.3.5 Plan for professional practice development and performance of others.

### **3.4. General & Transferable skills**

**By the end of the doctorate student program in industrial biotechnology specialty, the graduate must be able to:**

3.4.1 Communicate effectively using different means.

3.4.2. Use information technology to improve professional practice.

3.4.3. Teach and evaluate others.

3.4.4. Perform self appraisal and seek continuous learning.

3.4.5. Use different resources to obtain information and knowledge.

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#### **4- Bench Marks: ARS**

There is external bench marks for minor specialist interest of industrial biotechnology.

Academic reference standards (ARS), Master of Science Program (March 2009), which were issued by the National Authority for Quality Assurance & Accreditation of Education NAQAAE

4.1. External bench marks ملحوظ رقم ١

##### **4.1. Knowledge & Understanding**

**By the end of the study of Doctorate program of any specialty from Industrial Biotechnology, the graduate must have fluent deep knowledge & understanding of:**

4.1.1. Basic facts, theories and recent advances of the Industrial biotechnology and related subjects.

4.1.2. Basics , methodologies and scientific research ethics as its different tools

4.1.3. Ethical and legal fundamentals (research writing – supervising – authorizing – applying) and their applications on the field of Industrial biotechnology.

4.1.4. Quality standards of professional practice in the field of Industrial biotechnology.

4.1.5 Knowledge related to the professional practice impact on the environment development and conservation.

##### **4.2. Intellectual Skills**

**By the end of the Doctorate program study in any specialty, the graduate must be able to:**

4.2.1. Analyze, evaluate and deduce the information in the field of Industrial biotechnology and food safety.

4.2.2. Solve the specialized problems according to available data of Industrial biotechnology.

4.2.3. Conduct research studies that add knowledge to Industrial biotechnology.

4.2.4. Write and publish scientific articles in the field of Industrial biotechnology.

4.2.5. Evaluate professional practice risks in Industrial biotechnology.

4.2.6. Plan to improve specialty performance in the field of Industrial biotechnology.

4.2.7. Take decisions in various professional situations including dilemmas and controversial issues

4.2.8. Add to the specialty field through creativity & innovation.

4.2.9. Manage discussions on basis of evidence and proofs.

##### **4.3. Professional skills**

**By the end of Doctorate program study in any specialty, the graduate must:**

4.3.1. Master basic and advanced professional skills in the field of Industrial biotechnology.

4.3.2. Write and appraise professional reports about Industrial biotechnology.



4.3.3. Evaluate and improve methods and tools used in the field of Industrial biotechnology.

4.3.4. Use technological tools to serve professional practice.

4.3.5. Plan for professional practice development and performance of others.

#### 4.4. General & Transferable skills

**By the end of the study of Doctorate program of any specialty, the graduate must:**

4.4.1 Communicate effectively using different means.

4.4.2. Use information technology to improve professional practice.

4.4.3. Teach and evaluate others.

4.4.4. Perform self-appraisal and seek continuous learning.

4.4.5. Use different resources to obtain information and knowledge.

4.4.6. Work in and lead a team.

4.4.7. Manage scientific meetings and time.

#### 5. Curriculum Structure and Contents:

**a. Program duration: at least 3 years.**

**b. Program structure:**

**No. of hours/units: 44**

Lectures	27	Lab./Exercise	18	Total	45
Compulsory	32	Optional	---	Elective	13

▪ **Basic sciences courses**

No.	%
10	23

▪ **Social sciences and  
Humanity courses**

No.	%
3	7

**Specialized courses**

No.	%
31	70

▪ **Other sciences courses**

No.	%

No. %

▪ **Practical/Field Training**

**c. Program Levels (in credit-  
hours system): Not Applied**

The time spent in achievement of a thesis (8 hrs/week)



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## 6. Program courses:

### a- Compulsory (General Courses):

Code No.	Course Title	No. of Units (hrs)	No. of hours/week			Year/Level	Semester
			Lect.	Ex.	App.		
	Research and research methodology	6	2		8		
A-81	Computer II	3	2		2		
	German language	3	3	-			
A-24	Biotechnology II	3	3	-			
B5-4	Applied microbiology and fermentation	3	3	-			
B5-46	Special topics	3	3	-			
B5-47	Seminars	3	---		6		
	<b>Total</b>	24	16		16		

### b. Elective: Specialized courses (at least 4 courses from the listed below courses)

Code No.	Course Title	No. of Units	No. of hours/week			Year/Level	Semester
			Lect.	Ex.	Lab/ App.		
B5-2	Anaerobic process of waste treatment and utilization II	3	3				
B5-6	Biochemical reactors II	3	3				
B5-8	Bioengineering principles	3	3				
B5-12	Downstream processing in biotechnology	3	3				
B5-14	Enzyme technology II	3	3				
B5-15	Enzymes and hormones	3	3				
B5-17	Fermentation and enzyme technology	3	3				
B5-29	Instrumentation, modeling, and computer control of fermentation processes	3	3				
B5-30	Modern methods of organic synthesis	3	3				
B5-21	Food toxicology	3	3				
B5-35	Pharmaceutical industries	3	3				
C-28	Experimental food microbiology	3	2		2		
B5-10	Chemistry of natural products	3	3				



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### c. PhD dissertation (at least two academic years)

All PhD-degree students should prepare a thesis in Industrial biotechnology. The department and the ethical committees must approve the protocol of the research. The thesis should include a review part and a research part. The thesis is supervised by one or more senior staff members of the Department of Industrial biotechnology and may include other specialties according to the nature of the research. The thesis should be evaluated and approved by a committee of three professors including one of the supervisors and an external professor.

### 6. Program admission requirements:

1- M.Sc. in Genetic Engineering and Biotechnology in the field of Industrial biotechnology and closely related specializations OR M.Sc. from equivalent recognized institution in a related field to Industrial Biotechnology (after assessing the MSc thesis and passing the departmental discussion with the candidate)

### 7. Regulations for progression and program completion:

- Successful completion of the required courses (equivalent to at least 18 units) in addition to compulsory courses: German language, advanced computer, Research and research, special topics and Seminars.
- Student success in any course of study is estimated in one of the following estimates:

Excellent	From 90 to 100 degrees
Very Good	From 80 to less than 90 degrees
Good	From 70 to less than 80 degrees
Pass	From 60 to less than 70 degrees

- Successfully passes of both oral and written qualifying examinations.
- Approved completion of the research experiments.
- Approved scientific writing of Ph.D. dissertation.
- Successfully passes of dissertation open defense examination.



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### 8. Assessment methods for Evaluating program Applicants:

No.	Method	Intended Learning Outcomes ' ILO's '
1	Semester Works( 5 <sup>th</sup> &10 <sup>th</sup> )	Measure Problems Solving Skills, Presentation, and Self learning.
2	Midterm Exam (6 <sup>th</sup> ) Week.	Measure Abilities on Concentration and Understanding Scientific Points & Background.
3	Oral Exam (14 <sup>th</sup> ) Week.	Measure Analysis, Presentation and Discussion Skills.
4	Written (Final) Exam (15 <sup>th</sup> ) Week.	Measure knowledge, understanding, intellectual and professional skills.
5	PhD dissertation	To assess the ability to write a review of literature, perform the needed practical steps and to present the results in tables and graphs. In addition, the skills of analysis of results and discussion with previous findings obtained by other authors are also assessed.

### 9. Program Evaluation methods:

No.	Evaluator	Tool	Sample
1	Students	Questionnaire	20
2	Alumni	Depth Meeting	5
3	Stakeholders (Employers)	Nucleus Meeting	5
4	External (Evaluators & Examiners)	Remarking Questionnaire & Nucleus Meeting	2
5	Others	Not Applied	-----





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## Matrix of Knowledge and Skills of Industrial Biotechnology

### Doctorate Program Targeted

			Knowledge and understanding skills						
			a	b	c	d	e	F	
1		German Language	X						
2	A-81	Advanced Computer						X	
3		Research and Research Methodology			X				
4	A-24	Advanced biotechnology		X					
5	B5-45	Special Topics						X	
6	B5-46	Seminars				X			
7	B5-4	Applied microbiology and fermentation		X					X
8	B5-2	Anaerobic process of waste treatment and utilization II	X						
9	B5-6	Biochemical reactors II			X				
10	B5-8	Bioengineering principles							
11	B5-10	Chemistry of natural products							X
12	B5-12	Downstream processing in biotechnology						X	
12	B5-14	Enzyme technology II							X
13	B5-15	Enzymes and hormones				X			
14	B5-17	Fermentation and enzyme technology	X						
15	B5-21	Food toxicology		X					
16	B5-29	Instrumentation, modeling, and computer control of fermentation processes		X					
17	B5-30	Modern methods of organic synthesis				X			
18	B5-21	Food toxicology		X					
19	B5-35	Pharmaceutical industries			X				
20	C-28	Experimental food microbiology						X	
PhD dissertation			X	X	X	X	X	X	X



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No.	Course No.	Course title	Intellectual skills											
			a	b	c	d	e	f	g	h	i	j		
1		German Language		X										
2		Research and Research Methodology				X								
3	A-24	Advanced biotechnology					X							
4	A-81	Advanced Computer	X							X				
5	B5-45	Special Topics									X			
6	B5-46	Seminars												X
7	B5-4	Applied microbiology and fermentation			X			X				X		
8	B5-2	Anaerobic process of waste treatment and utilization II		X										
9	B5-6	Biochemical reactors II	X											
10	B5-8	Bioengineering principles			X									
11	B5-10	Chemistry of natural products			X									
12	B5-12	Downstream processing in biotechnology					X							
13	B5-14	Enzyme technology II								X				
14	B5-15	Enzymes and hormones								X				
15	B5-17	Fermentation and enzyme technology				X								
16	B5-21	Food toxicology									X			
17	B5-29	Instrumentation, modeling, and computer control of fermentation processes						X						
18	B5-30	Modern methods of organic synthesis									X			
19	B5-35	Pharmaceutical industries												X
20	C-28	Experimental food microbiology										X		
PhD dissertation			X	X	X	X	X	X	X	X	X	X	X	



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No.	Course No.	Coursetitle	Professional skills				
			a	b	c	d	e
1		German Language	X				
2		Research and Research Methodology		X			
3	A-24	Advanced biotechnology					X
4	A-81	Advanced Computer			X		
5	B5-45	Special Topics				X	
6	B5-46	Seminars		X			
7	B5-4	Applied microbiology and fermentation					X
8	B5-2	Anaerobic process of waste treatment and utilization II	X				
9	B5-6	Biochemical reactors II			X		
10	B5-8	Bioengineering principles					X
11	B5-12	Downstream processing in biotechnology	X			X	
12	B5-14	Enzyme technology II		X			
13	B5-15	Enzymes and hormones				X	
14	B5-17	Fermentation and enzyme technology					
15	B5-29	Instrumentation, modeling, and computer control of fermentation processes			X		
16	B5-30	Modern methods of organic synthesis				X	
17	B5-21	Food toxicology		X			
18	B5-35	Pharmaceutical industries	X				
19	C-28	Experimental food microbiology					X
20	B5-10	Chemistry of natural products			X		
PhD dissertation			X	X	X	X	X



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No.	Course No.	Course title	General and transferable skills					
			a	b	c	d	e	f
1		German Language			X			
2		Research and Research Methodology					X	
3	A-24	Advanced biotechnology				X		X
4	A-81	Advanced Computer	X					
5	B5-45	Special Topics		X				
6	B5-46	Seminars			X			
7	B5-4	Applied microbiology and fermentation	X					
8	B5-2	Anaerobic process of waste treatment and utilization II						X
9	B5-6	Biochemical reactors II				X		
10	B5-8	Bioengineering principles			X			
11	B5-10	Chemistry of natural products	X					
12	B5-12	Downstream processing in biotechnology				X		
13	B5-14	Enzyme technology II	X					
14	B5-15	Enzymes and hormones		X				
15	B5-17	Fermentation and enzyme technology					X	
16	B5-21	Food toxicology			X			
17	B5-29	Instrumentation, modeling, and computer control of fermentation processes				X		
18	B5-30	Modern methods of organic synthesis						X
19	B5-35	Pharmaceutical industries		X				
20	C-28	Experimental food microbiology					X	
PhD dissertation			X	X	X	X	X	X

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