



ZIAUDDIN UNIVERSITY
EXAMINATION BOARD

**Higher Secondary School Certificate
(HSSC)**

Examination Syllabus

**Microbiology
XI**

**Based on National Curriculum of
Pakistan**

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PREFACE

The Ziauddin University Examination Board (ZUEB) was established under **Sindh ACT XLI 2018**, with the primary objective of enhancing the quality of education in Sindh. ZUEB is responsible for administering examinations for the **Secondary School Certificate (SSC)** and **Higher Secondary School Certificate (HSSC)** in alignment with the most recent revisions to the **National Curriculum**, as outlined by the **Ministry of Federal Education and Professional Training, Government of Pakistan**. Through its ordinance, ZUEB is mandated to provide examination services for both English, Urdu, and Sindhi medium candidates from private schools across Sindh. This examination syllabus reflects ZUEB's dedication to achieving the educational goals set by the provincial authorities.

In collaboration with subject professors, ZUEB has developed a comprehensive syllabus for each subject. It is important to distinguish between the syllabus and the curriculum. The syllabus serves as a guide for both teachers and students, outlining the key areas of focus within the subject. It provides students with a clear understanding of what is expected of them in their studies and helps them prepare effectively for their exams.

This examination syllabus incorporates all cognitive outcomes derived from the **Provincial Curriculum Statement**, ensuring that assessments are both valid and reliable. While the focus is primarily on the cognitive domain, significant emphasis is placed on the application of knowledge and understanding.

The syllabus is made available to all stakeholders via the ZUEB website to assist affiliated schools in planning their teaching. It is crucial to note that the syllabus, rather than the prescribed textbook, forms the foundation of ZUEB examinations. Additionally, this syllabus supports the development of learning materials for both students and teachers. ZUEB remains committed to supporting students undertaking the SSC and HSSC courses by facilitating their learning outcomes through this detailed syllabus document.

To further assist in the learning process, ZUEB plans to provide a dedicated **e-resource tab** on its website, offering both text-based and video content on various subjects. These 15-20 minute instructional videos, created around key subject concepts, allow students to learn at their own pace and convenience. The videos can be used as a reinforcement tool to revisit lessons already taught or as pre-lesson material. This initiative is an ongoing effort, and new videos will continue to be uploaded.

We encourage all students and educators to make the most of these resources for a more enriched and flexible learning experience.

Sincerely,
Shahbaz Nasim
Head – Measurement & Testing
Ziauddin University Examination Board

Reviewed by:
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Rationale For The Reviewed Provincial Curriculum

The process of revising the National Curriculum 2006 began in August 2004, when the newly elected government of Pakistan initiated education reforms across the country. These reforms included the introduction of a new National Education Policy, a National Education Census, and a revision of curricula (Ministry of Education, 2009).

In practice, the overhaul of the secondary school curriculum began in 2006, leading to a review of the scheme of studies for classes I to XII and the revision of curricula for 25 compulsory subjects.

The 18th Amendment to the Constitution of Pakistan, enacted in 2010, significantly altered the federal-provincial relationship by abolishing the "concurrent legislative list." This amendment granted provinces greater legislative and financial autonomy in sectors such as education and health. The most notable implication of the 18th Amendment for education was the transfer of responsibility for curriculum development, syllabus planning, policy formation, and educational standards to the provinces, marking a significant step forward for education.

The School Education Department tasked a Curriculum Review Team with revising the National Curriculum 2006 for all subjects. The goal was to create a curriculum better suited to the needs of students and teachers while aligning with the principles of the 18th Amendment. Subject-specific curriculum review committees were established to critically examine and align the curriculum's content, both contextually and textually, ensuring coherence across various subjects. The Bureau of Curriculum (BoC) played a crucial role in organizing workshops and meetings in Hyderabad to facilitate the completion of this task. The support of numerous educationists, researchers, and teachers was invaluable in successfully revising the curriculum.

The revised National Curriculum, along with the original version, is available on the **ncc.gov.pk** website at <https://ncc.gov.pk/SiteImage/Misc/files/52-Medical%20Technology.pdf> for easy access.

The Ziauddin University Examination Board (ZUEB) SSC and HSSC syllabi are developed in accordance with the Revised Curriculum. To date, textbooks for various subjects have been developed based on the revised curriculum.

ZIAUDDIN UNIVERSITY EXAMINATION BOARD
SLOs CATEGORIZATION
XI-Microbiology
Detailed Syllabus

	Aims	SLO No.	SLOs Student Learning Outcomes	K	U	A
A: Introduction to Microbiology						
A	Develop a strong understanding of historical milestones, key discoveries, and the importance of microorganisms, including their applications in science, healthcare, and the community.	A-01	Recall key milestones and contributors in the history of Microbiology.	✓		
		A-02	Identify the contributions of key historical figures in; Discovery, Transition, Golden and Modern eras of Microbiology within their historical contexts.	✓		
		A-03	Explain the importance of Microbiology in relation to human health and the environment.		✓	
		A-04	Identify the applied areas of Microbiology.	✓		
B: Microscope						
B	Exhibit comprehensive knowledge of the history, basic components, types, applications, and limitations of microscopes, and effectively use them to analyze specimens.	B-01	Recall the brief history of the microscope.	✓		
		B-02	Identify and describe the basic components of a microscope and their functions.		✓	
		B-03	Differentiate between various types of microscopes (Compound, Fluorescent, Dark Field, Phase Contrast, and Electron) with reference to their applications and limitations in specific scientific contexts.		✓	
		B-04	Analyze specimens using microscopes to differentiate			✓

	Aims	SLO No.	SLOs Student Learning Outcomes	K	U	A
			between various microscopic structures. (LAB)			
C: Sterilization and Disinfection						
C	Students will be able to comprehend and describe the differences between sterilization and disinfection, as well as the various methods and quality control practices used to achieve sterilization in healthcare settings, industries and communities.	C-01	Define the terms sterilization and disinfection.	✓		
		C-02	Differentiate between the principles of sterilization and disinfection.		✓	
		C-03	Describe the physical methods used for sterilization.		✓	
		C-04	Explain the process of moist heat sterilization.		✓	
		C-05	Describe the function and operation of an autoclave.		✓	
		C-06	Explain the concept and application of flash sterilization.		✓	
		C-07	Describe the sterilization process using boiling.		✓	
		C-08	Explain the procedure and benefits of dry heat sterilization.		✓	
		C-09	Discuss the functioning and applications of a hot air oven.		✓	
		C-10	Explain the incineration method for sterilization.		✓	
		C-11	Discuss the principles and applications of the red heat method.		✓	
		C-12	Describe sterilization techniques that involve radiation.		✓	
		C-13	Explain the principles and uses of infrared and ultraviolet radiation in sterilization.		✓	

	Aims	SLO No.	SLOs Student Learning Outcomes	K	U	A
D: Microbial Culture Media						
D	Students will demonstrate proficiency in understanding the fundamental concepts of culture media in microbiology, including their classification, nutritional components, applications, and practical use. They will be able to effectively select and apply appropriate culture media based on classification and specific microbial requirements.	D-01	Define Culture Media.	✓		
		D-02	Explain the concept and purpose of culture media in Microbiology.		✓	
		D-03	Classify Culture Media: Describe the various types of culture media based on consistency, including solid, semi-solid, and liquid media.		✓	
		D-04	Differentiate between simple, complex, and synthetic media based on their nutritional components.		✓	
		D-05	Classify culture media based on their chemical composition and applications.		✓	
		D-06	Outline the diverse classifications of culture media such as basal, enriched, selective, enrichment, differential, transport, antimicrobial testing, and storage media.	✓		
		D-07	Differentiate between aerobic and anaerobic culture media, highlighting their significance in microbial growth.		✓	
		D-08	Discuss the practical applications of culture media in microbiology, with emphasis on their role in microbial cultivation and identification.			✓
		D-09	Select appropriate types of culture media based on their classification and experimental requirements. (LAB)		✓	
		D-10	Explain important composition of Media.		✓	

	Aims	SLO No.	SLOs Student Learning Outcomes	K	U	A
E: Microbial Staining Techniques						
E	Students will demonstrate proficiency in understanding staining techniques in microbiology, including the principles and procedural steps of Gram staining and Acid-Fast staining—specifically the Ziehl-Neelsen (heat method) and Kinyoun (cold method). They will be able to accurately describe the importance and applications of these techniques in microbial identification.	E-01	Explain the significance of staining in microbiology and describe commonly used staining techniques.		✓	
		E-02	Define the principle of Gram staining.	✓		
		E-03	Outline the steps involved in the Gram staining procedure.	✓		
		E-04	Describe the principle of Acid Fast Staining.		✓	
		E-05	Explain the procedural steps of the Ziehl-Neelsen stain (Heat method).		✓	
		E-06	Elucidate the steps involved in the Kinyoun stain (Cold method).		✓	
		E-07	Observe and identify stain slides of Gram positive and Gram negative organisms. (LAB)			
F: Classification of bacteria on the basis of Gram reaction and Morphology						
F	Students will demonstrate competence in categorizing bacteria based on Gram reaction and morphology into Gram-positive and Gram-negative groups. They will be able to list examples of Gram-positive cocci and bacilli, Gram-negative cocci and bacilli, and accurately comprehend terminology related to bacterial characteristics.	F-01	Classify Bacteria based on Gram reaction and Morphology into Gram-positive bacteria and Gram-negative bacteria.		✓	
		F-02	Enumerate examples of Gram-positive cocci.	✓		
		F-03	Enumerate examples of Gram-positive bacilli.	✓		
		F-04	Enumerate examples of Gram-negative cocci.	✓		
		F-05	Enumerate examples of Gram-negative bacilli.	✓		

	Aims	SLO No.	SLOs Student Learning Outcomes	K	U	A
		F-06	Explain the terms Hemolysis, Aerobic, Anaerobic, Obligate Aerobic, Obligate Anaerobic, Fastidious, Aerotolerant, and Microaerophilic.		✓	
		F-07	Observe Bacterial culture on culture media and under microscope. (LAB)			✓
G: Identification of Bacteria						
G	Students will learn the principles of key microbiological tests, such as Catalase, Coagulase, Mannitol Fermentation, DNase, Lactose Fermentation, Oxidase, and Antimicrobial testing using the Kirby-Bauer disc diffusion method, demonstrating their ability to explain these principles effectively.	G-01	Explain the principle of the catalase test.		✓	
		G-02	Describe the principle of the coagulase test.		✓	
		G-03	Outline the principle of the mannitol fermentation test.	✓		
		G-04	Define the principle of the DNase test.	✓		
		G-05	Explain the principle of lactose fermentation.		✓	
		G-06	Discuss the principle of the oxidase test.		✓	
		G-07	Explain the process of antimicrobial testing using the Kirby-Bauer disc diffusion method.		✓	
H: Virology						
H	Students will be able to state the general concepts of virology and explain the structure and classification of viruses.	H-01	Define Virology outlining its fundamental concepts.	✓		
		H-02	Describe the general characteristics of viruses.		✓	
		H-03	Describe the structure of viruses.		✓	
		H-04	Classify viruses based on their general characteristics.		✓	

	Aims	SLO No.	SLOs Student Learning Outcomes	K	U	A
		H-05	Draw and label the structure of viruses. (LAB)		✓	

Ziauddin University Examination Board
Grade XI-Microbiology
Table of Specification (TOS)

S.No	Domains	Weightage in assessment 100%	MCQs 1 mark each	PBA's 1 mark each	CRQs 4 marks each	ERQs 8 marks each
1	Introduction To Microbiology	4 %	1	–	1	–
2	Microscope	13 %	2	3	1	1
3	Sterilization & Disinfection	18 %	3	–	3	1
4	Microbial Culture Media	17 %	2	4	2	1
5	Microbial Staining Techniques	14 %	2	4	1	1
6	Classification of Bacteria On the Basis of Gram Reaction & Morphology	13 %	2	2	1	1
7	Identification Of Bacteria	5 %	2	–	1	–
8	Virology	16 %	3	2	2	1
Total # of Questions asked			17	15	12	3 (with sub parts a and b, each of 8 marks)
Total # of Questions to be attempted			17	15	9	2 (with sub parts)
Maximum marks attainable			17 marks	15 marks	36 marks	32 marks

Ziauddin University Examination Board
Grade XI
Microbiology
Scheme of Assessment

Maximum marks: 100

Section "A"

- | | |
|--|----------------------|
| Multiple Choice Questions (MCQs) | (17 x 1 = 17) |
| ➤ Attempt 17 MCQs: Each carries equal marks. | |
|
 | |
| Practical based assessments (PBAs) | (15 x 1 = 11) |
| ➤ Attempt 15 MCQs: Each carries equal marks. | |

Section "B" (Constructed Response Questions)

- | | |
|--|---------------------|
| Constructed Response Questions (CRQs) | (9 x 4 = 36) |
| ➤ Attempt any 9 questions out of 12. Each carries equal marks. | |

Section "C" (Extended Response Questions)

- | | |
|---|---------------------|
| Extended Response Questions (ERQs) | (4 x 8 = 32) |
| ➤ Attempt any 2 questions with its both sub parts (a and b) out of three questions. | |
| ➤ Each sub part consists of eight (08) marks. | |

DEFINITIONS OF COGNITIVE LEVELS

Remember

Remembering is the act of retrieving knowledge and can be used to produce things like definitions or lists. The student must be able to recall or recognise information and concepts. The teacher must present information about a subject to the student, ask questions that require the student to recall that information and provide written or verbal assessment that can be answered by remembering the information learnt.

Question Stems

- Can you name all the ...?
- Describe what happens when ...?
- How is (are) ...?
- How would you define ...?
- How would you identify ...?
- How would you outline ...?
- How would you recognise...?
- List the ... in order.
- What do you remember about ...?
- What does it mean?
- What happened after?
- What is (are) ...?
- What is the best one?
- What would you choose ...?
- When did ...?
- Where is (are) ...?
- Which one ...?
- Who spoke to ...?
- Who was ...?
- Why did ...?

Understand

The next level in the taxonomic structure is Understanding, which is defined as the construction of meaning and relationships. Here the student must understand the main idea of material heard, viewed, or read and interpret or summarise the ideas in their own words. The teacher must ask questions that the student can answer in their own words by identifying the main idea.

Question Stems

- Can you clarify...?
- Can you illustrate ...?
- Condense this paragraph.
- Contrast ...
- Does everyone think in the way that ... does?
- Elaborate on ...
- Explain why ...
- Give an example
- How can you describe...?
- How would you clarify the meaning...?
- How would you compare ...?
- How would you differentiate between.....?
- How would you describe...?
- How would you generalise...?
- How would you identify ...?
- Is it valid that ...?
- Is this the same as ...?
- Outline ...
- Select the best definition...
- State in your own words...
- This represents ...
- What are they saying?
- What can you infer from ...?
- What can you say about ...?
- What could have happened next?
- What did you observe?

	<ul style="list-style-type: none"> • What does this mean? • What expectations are there? • What information can you infer from...? • What is the main idea of ...? • What restrictions would you add? • What seems likely? • What seems to be ...? • What would happen if ...? • What might happen if ...? • Which are the facts? • Which statements support ...?
<p>Apply</p> <p>The third level in Bloom’s taxonomy, Applying, marks a fundamental shift from the pre-Bloom’s learning era because it involves remembering what has been learnt, having a good understanding of the knowledge, and applying it to real-world exercises, challenges or situations. Students must apply an abstract idea in a concrete case to solve a problem or relate it to prior experience. The teacher must provide opportunities for students to use theories and problem-solving techniques in new situations and review and check their work. Assessment questions should be provided that allow students to define and solve problems.</p> <p>Question Stems</p> <ul style="list-style-type: none"> • Can you group by characteristics such as ...? • Choose the best statements that apply... • Clarify why ... • Do you know of another instance where ...? • Draw a story map... • Explain why a character acted in the way that he did... • From the information given, can you develop a set of instructions about ...? • How would you develop ...? • How would you change ...? • How would you demonstrate...? 	<p>Analyse</p> <p>Analysing is the cognitive level where students can take the knowledge they have remembered, understood and applied, then delve into that knowledge to make associations, discernments or comparisons. Students should break down a concept or idea into parts and show relationships between these parts. Teachers must give students time to examine concepts and their requisite elements. Students are required to explain why they chose a solution.</p> <p>Question Stems</p> <ul style="list-style-type: none"> • Can you distinguish between ...? • Can you explain what must have happened when ...? • Determine the point of view, bias, values, or intent underlying the presented material... • Discuss the pros and cons of ... • How can you classify ... according to ...? • How can you compare the different parts? • How can you sort the different parts...? • How is ... connected to ...? • How is ... similar to ...? • How would you categorise...? • How would you explain...?

<ul style="list-style-type: none"> • How would you develop? • How would you explain ...? • How would you modify ...? • How would you present...? • How would you solve ...? • Identify the results of ... • Illustrate the ... • Judge the effects of ... What would result ...? • Predict what would happen if ... • Tell how much change there would be if ... • Tell what would happen if ... • What actions would you take to perform ...? • What do you think could have happened next? • What examples can you find that? • What other way would you choose to ...? • What questions would you ask of ...? • What was the main idea ...? • What would the result be if ...? • Which factors would you change if ...? • Who do you think...? • Why does this work? • Write a brief outline ... • Write in your own words ... 	<ul style="list-style-type: none"> • What could the ending have been if ... had taken place? • State the point of view of ... • What are some of the problems of ...? • What assumptions ...? • What can you infer about...? • What can you point out about....? • What conclusions ...? • What do you see as other possible outcomes? • What does the author assume? • What explanation do you have for ...? • What ideas justify the conclusion? • What ideas validate...? • What is the analysis of ...? • What is the function of ...? • What is the problem with ...? • What motive is there? • What persuasive technique is used? • What statement is relevant? • What was the turning point? • What were some of the motives behind ...? • What's fact? Opinion? • What's the main idea? • What's the relationship between? • Which events could not have happened? • Why did ... changes occur? • Why do you think ?
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BLOOM'S TAXONOMY WITH EXAMPLES

If you are a teacher looking for ways to engage your students in learning, this LIST of questions might be interesting for your classroom practice. Bloom's Taxonomy question stems can help elicit higher-order thinking skills and promote critical thinking among learners at different taxonomy levels. These question stems can also encourage students to think about their knowledge through reflection before answering questions.

ACTION WORDS FOR COGNITIVE LEVELS

Knowledge	Understand	Apply	Analyze	Evaluate	Create
	 <small>UNDERSTAND</small>				
define	explain	solve	analyze	reframe	design
identify	describe	apply	appraise	criticize	compose
describe	interpret	illustrate	judge	evaluate	create
label	paraphrase	modify	support	order	plan
list	summarize	use	compare	compare	combine
name	classify	calculate	decide	classify	formulate
state	compare	change	discriminate	contrast	invent
match	differentiate	choose	recommend	distinguish	hypothesize
recognize	discuss	demonstrate	summarize	infer	substitute
select	distinguish	discover	assess	separate	write
examine	extend	experiment	choose	explain	compile
locate	predict	relate	convince	select	construct
memorize	associate	show	defend	categorize	develop
quote	contrast	sketch	estimate	connect	generalize
recall	convert	complete	grade	differentiate	integrate
reproduce	demonstrate	construct	measure	divide	modify
tabulate	estimate	dramatize	predict	order	organize
tell	express	interpret	rank	prioritize	prepare
Copy	identify	manipulate	score	survey	produce

discover	indicate	paint	select	calculate	rearrange
duplicate	infer	prepare	test	conclude	rewrite
enumerate	relate	teach	argue	correlate	adapt
listen	restate	act	conclude	deduce	anticipate
observe	select	collect	consider	devise	arrange
omit	translate	compute	critique	diagram	assemble
read	ask	explain	debate	dissect	choose
recite	cite	list	distinguish	estimate	collaborate
record	discover	operate	editorialize	evaluate	facilitate
repeat	generalize	practice	justify	experiment	imagine
retell	group	simulate	persuade	focus	intervene
visualize	illustrate	transfer	rate	illustrate	make
	judge	write	weigh	organize	manage
	observe			outline	originate
	order			plan	propose
	report			question	simulate
	represent			test	solve
	research				support
	review				test
	rewrite				validate
	show				

HSSC PART I EXAMINATION

MARKS BREAKUP GRID FOR EXAMINATION 2026

GROUP: PRE-MEDICAL

SUBJECT	THEORY	PBA	TOTAL
ENGLISH	100	-	100
URDU NORMAL / URDU EASY	100	-	100
ISLAMIYAT / RELIGIOUS STUDIES	50	-	50
PHYSICS	85	15	100
CHEMISTRY	85	15	100
BIOLOGY	85	15	100
TOTAL	505	45	550

GROUP: PRE-ENGINEERING

SUBJECT	THEORY	PBA	TOTAL
ENGLISH	100	-	100
URDU NORMAL / URDU EASY	100	-	100
ISLAMIYAT / RELIGIOUS STUDIES	50	-	50
PHYSICS	85	15	100
CHEMISTRY	85	15	100
MATHEMATICS	100	--	100
TOTAL	520	30	550

GROUP: GENERAL SCIENCE

SUBJECT	THEORY	PBA	TOTAL
ENGLISH	100	-	100
URDU NORMAL / URDU EASY	100	-	100
ISLAMIYAT / RELIGIOUS STUDIES	50	-	50
PHYSICS	85	15	100
COMPUTER SCIENCE	75	25	100
MATHEMATICS	100	--	100
TOTAL	510	40	550

GROUP: COMMERCE

SUBJECT	THEORY	PBA	TOTAL
ENGLISH	100	-	100
URDU NORMAL / URDU EASY	100	-	100
ISLAMIYAT / RELIGIOUS STUDIES	50	-	50
ECONOMICS	75	-	75
P.O.C	75	-	75
ACCOUNTING	100	--	100
BUSINESS MATHEMATICS	50		50
TOTAL	550	---	550

GROUP: HUMANITIES

(Any Three Electives)

SUBJECT	THEORY	PBA	TOTAL
ENGLISH	100	-	100
URDU NORMAL / URDU EASY	100	-	100
ISLAMIYAT / RELIGIOUS STUDIES	50	-	50
COMPUTER SCIENCE	75	25	100
ISLAMIC STUDIES	100		100
MATHEMATICS	100	-	100
SOCIOLOGY	100	--	100
ECONOMICS	100		100
EDUCATION	100		100
CIVICS	100		100
NURSING	85	15	100
TOTAL	550	---	550

GROUP: MEDICAL TECHNOLOGY

SUBJECT	THEORY	PBA	TOTAL
ENGLISH	100	-	100
URDU NORMAL / URDU EASY	100	-	100
ISLAMIYAT / RELIGIOUS STUDIES	50	-	50
MICROBIOLOGY	85	15	100
HEMATOLOGY & BLOOD BANKING	85	15	100
ANATOMY & PHYSIOLOGY	85	15	100
TOTAL	505	45	550

GROUP: PRE-NURSING

SUBJECT	THEORY	PBA	TOTAL
ENGLISH	100	-	100
URDU NORMAL / URDU EASY	100	-	100
ISLAMIYAT / RELIGIOUS STUDIES	50	-	50
BIO-CHEMISTRY	85	15	100
FUNDAMENTALS OF NURSING	85	15	100
ELEMENTARY ANATOMY & MICRO TECHNIQUE	85	15	100
TOTAL	505	45	550