



آغا خان یونیورسٹی ایگزامینیشن بورڈ  
AGA KHAN UNIVERSITY EXAMINATION BOARD

Pacing Guide for Teachers

# BIOLOGY (BOTANY)

Grade XI  
(Theory)

Number of weeks: 28

Number of periods per week: 3

Key Textbook: Biology for Grade 11, Punjab Textbook Board, Lahore

Teacher Developer(s): Rukhshinda Aftab

Institution(s): Aga Khan Higher Secondary School, Karachi

## Topic

4.The Cell

## Total Periods

10

Sub-Topic	Range of SLOs	Periods (40 mins)
4.1 Discovery of Cell 4.2 Microscope	4.1.1- 4.2.1	Can be catered in Practical
4.3 Techniques used in Cell Biology	4.3.1	1
4.4 Structure of Animal and Plant Cell	4.4.1(a)	1
4.4 Structure of Animal and Plant Cell	4.4.1(b)	1
4.4 Structure of Animal and Plant Cell	4.4.1(c+d+e)	1
4.4 Structure of Animal and Plant Cell	4.4.1(f+i+j)	1
4.4 Structure of Animal and Plant Cell	4.4.1(g+h)	1
4.4 Structure of Animal and Plant Cell	4.4.1(k+l)	1
4.4 Structure of Animal and Plant Cell	4.4.1(m)	1
4.4 Structure of Animal and Plant Cell	4.4.2	1

4.4 Structure of Animal and Plant Cell	4.4.3	1
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## Learning Resources

- A Textbook of Biology for Grade XI by Sindh Textbook Board, Jamshoro
- Campbell & Reece Biology (8th or 9th Edition)
- Textbook of Biology Grade XI by National Book Foundation as Federal Textbook Board, Islamabad

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Practice Activity

Begin with a pretest where students label the parts of a microscope and provide their functions. After collecting the pretests, provide correct answers to help students refine their understanding.

Introduce the concept of magnification and explain the formula for calculating magnification. Provide students with different problems calculating magnification using the formula.

Divide students into small groups. Each group is given a microscope, a prepared microscope slide, and instructions for focusing. Instruct students to focus on the specimen using both low power and high-power objectives. Emphasise the importance of precautions to avoid damaging the microscope or the slides.

Present guided questions to enhance students' understanding, i.e., Describe the changes in the field of view as switching from low power to high power.

How does the amount of available light changes when transitioning from low power to high power?

By engaging students in this hands-on activity and guided exploration, they will gain a better understanding of microscope operation, potential problems, and effective solutions when using different power levels.

### Activity 2:

#### Hands on Activity

Utilise diagrams, illustrations, and animations to visually represent the lipid bilayer, embedded proteins, and their dynamic movements. By integrating experimental observations, theoretical concepts, and visual aids, the fluid mosaic model can be constructed to explain the dynamic and complex structure of biological membranes.

[https://www.youtube.com/results?search\\_query=fluid+mosaic+model+construction+and+working](https://www.youtube.com/results?search_query=fluid+mosaic+model+construction+and+working)

## Activity 3

### Flipped classroom:

Assign pre-class readings or videos on cell biology topics, allowing class time to be used for discussions, problem-solving, and application of knowledge. This approach promotes active learning and deeper understanding.

## Activity 4

### Post Test:

The teacher can assess students' comprehension of the chapter through various testing methods, including multiple-choice questions (MCQs), constructed-response questions (CRQs), and extended-response questions (ERQs). These questions can be sourced from previous papers or model papers of AKU EB. Alternatively, the teacher can create worksheets using the learning resources recommended in the AKU EB Learning Resource guide. Administering this test will offer teachers valuable insights into the students' grasp of the chapter's content and their overall learning progress.

## Further Resources

For additional resources related to teaching, learning and formative assessments, please refer to Learn Smart Classroom by Knowledge Platform:

<https://akueb.knowledgeplatform.com/login>



## Topic

## Total Periods

5. Classification and Acellular life

10

Sub-Topic	Range of SLOs	Periods (40 mins)
5.1 Classification of Living Organisms	5.1.1- 5.1.2	1
5.2 Nomenclature 5.3 Two and Five-Kingdom System	5.2.1- 5.2.2 5.3.1	1
5.4 Characteristics of Viruses	5.4.1- 5.4.3	1
5.5 Classification of Viruses	5.5.1- 5.5.2	1
5.6 Life Cycle of Viruses	5.6.1	1
	5.6.2	1
5.7 Viral Diseases	5.7.1(a+b+d)	1
	5.7.1(c+e)	1
5.8 Prions and Viroids	5.8.1-5.8.2	1
5.9 Economic and Human Loss by Viruses	5.9.1	1

## Learning Resources

- A Textbook of Biology for Grade XI by Sindh Textbook Board, Jamshoro
- Campbell & Reece Biology (8th or 9th Edition).
- Textbook of Biology Grade XI by National Book Foundation as Federal Textbook Board, Islamabad

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Animation

<https://www.youtube.com/watch?v=hFwA0aBX5bE>

Introduce the topic of the lysogenic cycle and explain its importance in bacteriophage biology. Show this video that demonstrates the lysogenic cycle of a bacteriophage in a clear and engaging manner. After watching the video, distribute blank sheets of paper or provide digital drawing tools to the students.

Instruct students to draw and label each step of the lysogenic cycle as shown in the video. Encourage them to be as detailed as possible and use visual cues to represent the different stages.

Once the drawings are complete, ask students to explain each step in their own words. This can be done through written explanations accompanying their drawings or through verbal presentations. Invite selected students to present their drawings and explanations to the entire class. As each student presents, encourage questions and clarifications from their peers. This interactive presentation format enhances public speaking skills and encourages active listening.

### Activity 2:

#### Group Discussion Activity

Engage with Examples: Teachers can begin by discussing familiar organisms from each kingdom, such as animals, plants, fungi, protists, and bacteria. Relate these examples to the concept of classification.

### Activity 3:

#### Interactive Sorting:

Provide cards or images of various organisms and have students sort them into the five kingdoms. This hands-on activity reinforces the idea of grouping based on shared characteristics.

## Activity 4:

### Venn Diagrams:

Use Venn diagrams to compare and contrast the characteristics of organisms in different kingdoms. This visual representation helps students understand the relationships and differences.

## Activity 5:

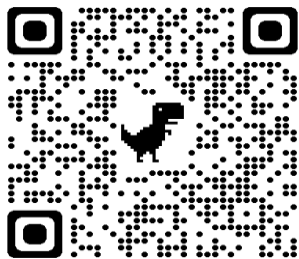
### Students Presentations

Teachers can organise students into distinct groups and assign each group a specific viral disease to research and present. This activity not only cultivates students' abilities to collaborate effectively within a group but also boosts their self-assurance in delivering presentations before the class.

## Further Resources

For additional resources related to teaching, learning and formative assessments, please refer to **Learn Smart Classroom by Knowledge Platform**:

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## Topic

6. Kingdom Prokaryote

## Total Periods

12

Sub-Topic	Range of SLOs	Periods (40 mins)
6.1 Characteristic Features of Prokaryotes 6.2 Morphology of Bacteria	6.1.1 6.2.1- 6.2.2	1
6.2 Morphology of Bacteria	6.2.3	1
	6.2.4	1
	6.2.5	1
6.3 Nutrition in Bacteria	6.3.1- 6.3.2	1
6.4 Respiration in Bacteria	6.4.1	1
6.5 Locomotion in Bacteria	6.5.1	1
6.6 Growth in Bacteria	6.6.1	1
6.7 Reproduction in Bacteria	6.7.1(a+b)	1
	6.7.1(c)	1



6.8 Economic Importance of Bacteria	6.8.1- 6.8.2	1
6.9 Control and Prevention of Bacteria	6.9.1- 6.9.3	1
6.10 Cyanobacteria	6.10.1- 6.10.3	Can be catered in Practical

## Learning Resources

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- Textbook of Biology Grade XI by National Book Foundation as Federal Textbook Board, Islamabad

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Video Demonstration:

The teacher will plan to show a video that depicts the structure of bacterial cells and their functions. Animated videos can help visualise complex processes like bacterial movement and reproduction.

<https://www.youtube.com/watch?v=4DYgGA9jdIE>

### Activity 2:

#### Concept Mapping:

The teacher will facilitate the students to create concept maps that outline the unique characteristics of Gram-positive and Gram-negative cell walls. Link each component to its respective function and significance.

### Activity 3:

#### Formative Assessment:

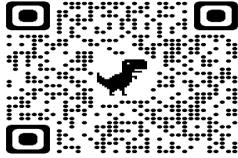
Teachers can use regular quizzes, polls, and short assignments to gauge student understanding throughout the learning process. This provides feedback and allows for timely intervention if misconceptions arise.

<https://quizizz.com/admin/quiz/5cc988c2ec94c0001fdff16c/bacterial-reproduction>

## Further Resources

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FOR ACADEMIC YEAR 2023 AND ONWARDS

## Topic

7.Kingdom Protista

## Total Periods

4

Sub-Topic	Range of SLOs	Periods (40 mins)
7.1 Unifying Feature	7.1.1	Can be catered in Practical
7.2 Diversity among Protists	7.2.1	Can be catered in Practical
7.4 Plant-like Protists	7.4.1-7.4.2	1
	7.4.3	1
7.5 Fungi-like Protists	7.5.1	1
	7.5.2	1

## Learning Resources

- A Textbook of Biology for Grade XI by Sindh Textbook Board, Jamshoro
- Campbell & Reece Biology (8th or 9th Edition).
- Textbook of Biology Grade XI by National Book Foundation as Federal Textbook Board, Islamabad

# Suggested Activities and/or Formative Assessment

## Activity 1:

### Field Trips or Nature Walks:

Take students on field trips to local bodies of water or environments where protists can be observed. Connect their observations to the diversity and ecological importance of protists.

## Activity 2:

### Microscopic Observations:

Provide microscopes and prepared slides of various protists for students to observe. Guide them in identifying key structures, such as cilia, flagella, pseudopodia, chloroplasts, and cell walls.

## Activity 3:

### Venn Diagrams and Comparison Charts:

The teacher can employ Venn diagrams to facilitate a comparison between fungi-like protists and fungi, as well as between plant-like protists and plants. This approach provides students with a structured framework to effectively contrast various elements. Teacher can provide students with comparison charts that highlight the distinctions between plant-like, and fungus-like protists. Include information about nutrition, locomotion, reproduction, and ecological roles.

## Further Resources

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## Topic

8.Kingdom Fungi

## Total Periods

8

Sub-Topic	Range of SLOs	Periods (40 mins)
8.1 General Characteristics	8.1.1- 8.1.2	1
	8.1.3	1
	8.1.4	1
8.2 Classification of Fungi	8.2.1	3
8.2 Classification of Fungi 8.3 Land Adaptations of Fungi	8.2.1, 8.3.1	1
8.4 Importance of Fungi	8.4.1- 8.4.2	1

## Learning Resources

- A Textbook of Biology for Grade XI by Sindh Textbook Board, Jamshoro
- Campbell & Reece Biology (8th or 9th Edition).
- Textbook of Biology Grade 11 by National Book Foundation as Federal Textbook Board, Islamabad

# Suggested Activities and/or Formative Assessment

## Activity 1:

### Investigative Labs:

Provide microscopes, prepared slides and preserved specimen of fungal structures like hyphae, spores, and mycelium. Guide students in observing and identifying these structures. Ask them to draw labelled diagrams based on their observations. Further, the teacher can guide students in cultivating a culture of *Rhizopus* and creating a temporary slide to observe its structure.

## Activity 2:

### Comparison Charts:

Compare fungi to other organisms like plants and animals by using comparison charts, i.e., Venn diagram. Discuss the similarities and differences in terms of cell structure, nutrition, and reproduction.

## Activity 3:

### Interactive Diagrams OR Animated Videos:

Teachers can use interactive diagrams or flowcharts that illustrate the life cycles of different fungal groups or may use digital tools to allow students to click on different stages for detailed explanations.

Teachers can show animated videos that depict the life cycles of various fungal groups. Visual representations can help students visualise the stages and processes.

<https://www.youtube.com/watch?v=dksZQG2fCQM>

[https://www.youtube.com/watch?v=sxLBf\\_JMZaM](https://www.youtube.com/watch?v=sxLBf_JMZaM)

<https://www.youtube.com/watch?v=uw0SmlCtT60>

## Activity 4:

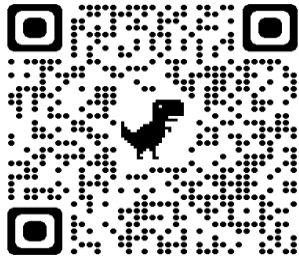
### Student Presentations:

Teacher can assign different types of mutualistic associations (lichen and mycorrhizae) to students in groups to research and present. This encourages independent research and the sharing of knowledge.

## Further Resources

For additional resources related to teaching, learning and formative assessments, please refer to **Learn Smart Classroom by Knowledge Platform**:

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FOR ACADEMIC YEAR 2023 AND ONWARDS

## Topic

9. Kingdom Plantae

## Total Periods

9

Sub-Topic	Range of SLOs	Periods (40 mins)
9.1 Diversity among Plants	9.1.1- 9.1.3	Can be catered in Practical
9.2 Bryophytes	9.2.1- 9.2.2	Can be catered in Practical
	9.2.3 – 9.2.5	1
9.3 Tracheophyta	9.3.1(a+b)	1
	9.3.1(c+d)	1
	9.3.2	1
	9.3.3- 9.3.4	1
9.4 Seed Plants	9.4.1- 9.4.2	1
	9.4.3	1
	9.4.4 -9.4.5	1



9.5 Angiospermic Families	9.5.1 (Discuss only economic importance of families)	1
	9.5.1(a+b)	Can be catered in Practical
	9.5.1(c+d)	Can be catered in Practical
	9.5.1(e+f)	Can be catered in Practical

## Learning Resources

- A Textbook of Biology for Grade XI by Sindh Textbook Board, Jamshoro
- Campbell & Reece Biology (8th or 9th Edition).
- Textbook of Biology Grade XI by National Book Foundation as Federal Textbook Board, Islamabad

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Comparative Analysis:

Group Discussions: Engage students in discussions that compare the features, reproductive strategies, and adaptations of non-vascular and vascular plants.

Venn Diagrams: Provide Venn diagrams for students to fill in, highlighting similarities and differences between the different groups of plants.

Interactive Quizzes: Create quizzes that test students' knowledge of the unique characteristics of each plant group.

### Activity 2:

#### Life Cycle Illustration:

Teacher may use visual aids that explain the lifecycles of different groups of tracheophytes, focusing on the role of the sporophyte and gametophyte generations.

### Activity 3:

#### Flower Dissection Labs:

Teachers can combine flower dissection with creating floral diagrams and formulas. Facilitate students to dissect a flower, identify its parts, and then represent them in the formula and diagram.

### Activity 4:

#### Guided Drawing Sessions:

Assist students through the process of creating floral diagrams step by step. Provide templates or worksheets for them to practice drawing floral diagrams accurately.

### Further Resources

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FOR ACADEMIC YEAR 2023 AND ONWARDS

## Topic

11. Bioenergetics

## Total Periods

10

Sub-Topic	Range of SLOs	Periods (40 mins)
11.1 Role of ATP 11.2 Photosynthesis	11.1.1- 11.1.2, 11.2.1-11.2.3	1
11.2 Photosynthesis	11.2.4	1
	11.2.5-11.2.6	1
	11.2.7	1
	11.2.8	1
	11.2.9	1
11.3 Respiration	11.3.1-11.3.2	1
	11.3.3-11.3.4 (a+b)	1
	11.3.4(c)	1
	11.3.4(d)	1

## Learning Resources

- A Textbook of Biology for Grade XI by Sindh Textbook Board, Jamshoro
- Campbell & Reece Biology (8th or 9th Edition).
- Textbook of Biology Grade XI by National Book Foundation as Federal Textbook Board, Islamabad

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Pretest:

The teacher will design a pretest to acquire insights into students' current understanding. This will enable them to customise their teaching approach according to students' preferences and requirements, fostering a sense of ownership over their learning journey.

### Activity 2:

#### Conceptual Videos:

The teacher can show videos that explain bioenergetics concepts using animations and simple explanations. These videos can provide visual clarity and enhance understanding.

<https://www.youtube.com/watch?v=IRg9NJAS2Q8>

<https://www.youtube.com/watch?v=Le7K0X91w7U>

[https://www.youtube.com/watch?v=IXisg9Z9\\_e8](https://www.youtube.com/watch?v=IXisg9Z9_e8)

<https://www.youtube.com/watch?v=iChb5hEDzqc>

[https://www.youtube.com/watch?v=\\_SkPwVO9BFI](https://www.youtube.com/watch?v=_SkPwVO9BFI)

#### Peer Discussions:

Assign pairs or small groups to discuss the video's content among themselves. Then, have them present their key insights or findings to the whole class.

### Activity 3:

#### Venn Diagram Activity

Teachers can guide students in employing Venn diagrams to compare various concepts, such as cyclic and non-cyclic phosphorylation, C<sub>3</sub>, C<sub>4</sub>, and CAM plants, as well as alcoholic fermentation and lactic acid fermentation. This activity offers students a structured approach to contrasting different topics.

## Activity 4:

### Socratic Seminars:

Teachers can organise a Socratic seminar where students engage in a structured dialogue about the topic's themes, implications, and their opinions.

## Further Resources

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FOR ACADEMIC YEAR 2023 AND ONWARDS

## Topic

12.Nutrition

## Total Periods

4

Sub-Topic	Range of SLOs	Periods (40 mins)
12.1 Nutrition in Plants	12.1.1-12.1.2, 12.1.3 (a+b)	1
	12.1.3 (c+d)	1
	12.1.4 (a+b)	1
	12.1.4 (c+d)	1

## Learning Resources

- A Textbook of Biology for Grade XI by Sindh Textbook Board, Jamshoro
- Campbell & Reece Biology (8th or 9th Edition).
- Textbook of Biology Grade XI by National Book Foundation as Federal Textbook Board, Islamabad

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Nutrient Deficiency Studies:

Teachers can present case studies or images of plants exhibiting nutrient deficiency symptoms. Challenge students to identify the lacking nutrient and explain the resulting effects.

## Activity 2:

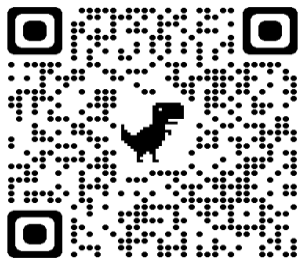
### Interactive Worksheets:

Teachers can design worksheets with scenarios where students must analyse the nutritional needs of plants in different environments. Encourage them to think critically about optimising nutrient intake.

### Further Resources

For additional resources related to teaching, learning and formative assessments, please refer to Learn Smart Classroom by Knowledge Platform:

<https://akueb.knowledgeplatform.com/login>



FOR ACADEMIC YEAR 2023 AND ONWARDS

## Topic

13.Gaseous exchange

## Total Periods

2

Sub-Topic	Range of SLOs	Periods (40 mins)
13.1 Gaseous Exchange in Plants	13.1.1-13.1.3	1
	13.1.4	1

## Learning Resources

- A Textbook of Biology for Grade XI by Sindh Textbook Board, Jamshoro
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## Further Resources

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**Topic****Total Periods**

14.Transport

15

Sub-Topic	Range of SLOs	Periods (40 mins)
14.1 Introduction	14.1.1-14.1.2,	1
14.2 Transportation in Plants	14.2.1	1
	14.2.2	1
	14.2.3	1
	14.2.4	1
14.3 Ascent of Sap	14.3.1-14.3.2,	1
	14.3.3-14.3.4	1
	14.3.3-14.3.4	1
14.4 Transpiration	14.4.1-14.4.2	1
	14.4.3(a)	1

	14.4.3(b)	1
	14.4.4-14.4.5	1
14.5 Translocation	14.5.1	1
	14.5.2	1
	14.5.2	1

## Learning Resources

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## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Visual Explanations:

Use diagrams or animations to visually explain the processes involved in the transport of water in plants. Emphasise the role of evaporation from leaves and the resulting negative pressure in the xylem.

<https://www.youtube.com/watch?v=Hloqv8mVJzY>

<https://www.youtube.com/watch?v=5CMrK8rlzZw>

<https://www.youtube.com/watch?v=XscwBiUCK18>

<https://www.youtube.com/watch?v=JFb-CWlz7kE>

## Activity 2:

### Flowcharts and Diagrams:

Provide flowcharts or diagrams illustrating the process of translocation in phloem. Break down the steps and use labels to explain source, sink, and pressure flow hypothesis.

## Activity 3:

**Storytelling or Comics:** Assist students to create short stories or comics illustrating the journey of a sugar molecule through the phloem.

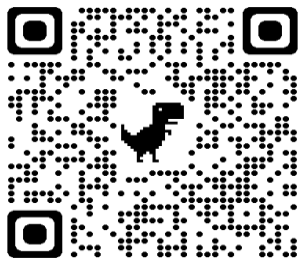
## Activity 4:

<https://quizizz.com/admin/quiz/5faa97fcbd7292001b973c89/ascent-of-sap>

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**Note:** This teacher-led pacing guide has been developed for AKU-EB affiliated schools to facilitate them by

- ensuring smooth transition of a school's academic year.
- ensuring curricular continuity in schools.
- predicting the time and pace of syllabi implementation.

This document also contains **suggested activities and/or formative assessments** that may enhance the learning experience. Please note that these activities are meant to serve as suggestions. As educators, you have the flexibility and autonomy to adapt and modify them to best suit the needs of your students and the dynamics of your classroom.

You are advised to use an ad-blocker while accessing the websites and web resources. In case any website is not functional for any reason, you may inform us at [examination.board@aku.edu](mailto:examination.board@aku.edu) for an alternative or search material via any search engine.

FOR ACADEMIC YEAR 2023 AND ONWARDS