



آغا خان یونیورسٹی ایگزامینیشن بورڈ  
AGA KHAN UNIVERSITY EXAMINATION BOARD

Pacing Guide for Teachers

# BIOLOGY (ZOOLOGY)

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): Musarrat Jabeen Lubna

Institution(s): Habib Public School, Karachi

## Topic

## Total Periods

1.Introduction to Biology

4

Sub-Topic	Range of SLOs	Periods (40 mins)
1.1 Major Fields of Specialisation in Biology 1.2 Levels of Biological Organisation Biology	1.1.1-1.2.1	2
1.3 Biological Method	1.3.1-1.3.2	1
1.4 Services of Biology	1.4.1	1

## Learning Resources

- A Textbook of Biology for grade XI by Sindh Textbook Board, Jamshoro
- Textbook of Biology Grade11 National Book Foundation as Federal Textbook Board, Islamabad
- Campbell, Reece. Biology (A Global Approach, Tenth Edition)

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Concept Map

Guide students in constructing a concept map that illustrates the interconnections between various branches of biology and their respective scopes.

### Activity 2:

#### Peer Review

Ask students to exchange their concept maps with peers and provide constructive feedback.

## Activity 3:

### Home Assignment

Teachers can choose an appropriate research topic and lead students through the research process, including formulating a hypothesis, proposing an experimental method, discussing inductive and deductive reasoning, and formulating a conclusion.

Provide students with various scenario-based questions that encourage them to distinguish between inductive and deductive reasoning when crafting hypotheses.

## Activity 3:

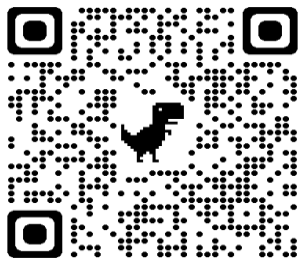
### Comparative analysis

Use a Venn diagram to compare and differentiate between theory, law, and hypothesis.

## 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

2.Biological Molecules

## Total Periods

15

Sub-Topic	Range of SLOs	Periods (40 mins)
2.1 Introduction to Biochemistry	2.1.1-2.1.2	1
	2.1.3-2.1.4	2
2.2 Properties of Carbon	2.2.1	1
2.3 Chemical Nature and Importance of Water	2.3.1-2.3.2	2
2.4 Carbohydrates	2.4.1 - 2.4.5	3
2.5 Lipids 2.6 Proteins	2.5.1- 2.5.4 2.6.1- 2.6.10	4
2.7 Nucleic Acids 2.8 Conjugated Molecules	2.7.1-2.8.2	2

## Learning Resources

- A Textbook of Biology for grade XI by Sindh Textbook Board, Jamshoro
- Textbook of Biology Grade11 National Book Foundation as Federal Textbook Board, Islamabad
- Cambell Biology,12 Edition (page no. 17 & 20)

## Web Resource

- <http://dept.clcillinois.edu/biodv/PrinciplesOfBiology.pdf>

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Lab Activity

Performing Benedict's test for reducing sugar and confirmation of the presence of starch through iodine test, confirmation of the presence of lipids through emulsion test, confirmation of the presence of proteins through Biuret test.

### Activity 2:

#### Visual Explanations:

Incorporate animated videos as a dynamic and engaging method to comprehend the structures of biomolecules, as well as the hydrolysis and condensation reactions that form and break bonds between their monomers. These videos provide a visual and interactive approach that enhances understanding.

<https://www.youtube.com/watch?v=QGkz7UAiGfQ>  
<https://www.youtube.com/watch?v=fq-baylLl8c>  
<https://www.youtube.com/watch?v=KNsFxPgsbrU>  
<https://www.youtube.com/watch?v=S6aIS2aoy9Q>

Provide a worksheet with guided questions that prompt students to analyse and critically think about the video's content.

### Activity 3:

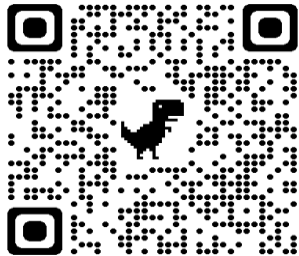
#### Problem-Solving Scenarios:

Present scenarios where students must apply the concepts from the video to solve a related problem. This tests their ability to use knowledge in practical situations.

## Further Resources

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FOR ACADEMIC YEAR 2023 AND ONWARDS

## Topic

3. Enzymes

## Total Periods

10

Sub-Topic	Range of SLOs	Periods (40 mins)
3.1 Structure of Enzyme, 3.2 Characteristics of Enzymes	3.1.1-3.2.1	2
3.3 Mechanism of Enzyme Action	3.3.1-3.3.4	2
3.4 Factors Affecting Enzyme Action	3.4.1,3.4.2,3.4.3	3
3.5 Enzyme Inhibition 3.6 Classification of Enzymes	3.5.1- 3.5.3, 3.6.1	3

## Learning Resources

- Textbook of Biology Grade11 National Book Foundation as Federal Textbook Board, Islamabad
- Campbell, Reece. Biology (A Global Approach, Tenth Edition)

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Enzyme Animation:

Use animations to visually depict how enzymes bind to substrates, undergo conformational changes, and facilitate the reaction.

[https://www.youtube.com/watch?v=ie\\_7Y7HJlps](https://www.youtube.com/watch?v=ie_7Y7HJlps)

<https://www.youtube.com/watch?v=C2gYhT9BrmQ>

<https://www.youtube.com/watch?v=BGw8chF9Fjl>

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

## Activity 2:

### Peer Teaching:

Have students pair up and take turns explaining different parts of the videos to each other. Teaching others solidifies one's own understanding.

## Activity 3:

### Follow-up Experiment or Demonstration:

Design a simple hands-on experiment or demonstration that relates to the video content, i.e., performing amylase test on starch with boiled amylase and un-boiled amylase in separate test tubes and confirmation through iodine test.

This bridges theoretical knowledge with practical application.

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## Topic

7.Kingdom Protista

## Total Periods

4

Sub-Topic	Range of SLOs	Periods (40 mins)
7.1 Unifying Features, 7.2 Diversity among Protists	7.1.1, 7.2.1	2
7.3 Animal-like Protists	7.3.1- 7.3.3	2 (1 Practical unit)

## Learning Resources

- A Textbook of Biology for grade XI by Sindh Textbook Board, Jamshoro
- Campbell & Reece Biology (8th or 9th Edition).
- Textbook of Biology Grade11 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 animal-like protists for students to observe. Guide them in identifying key structures, such as cilia, flagella and pseudopodia.

### Activity 3:

#### Venn Diagrams and Comparison Charts:

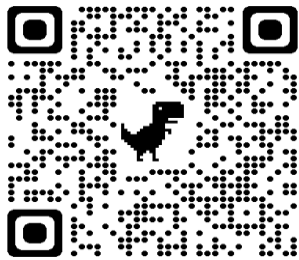
The teacher can employ Venn diagrams to facilitate a comparison between animal-like protists and animals. This approach provides students with a structured

framework to effectively contrast various elements. Teachers can provide students with comparison charts that highlight the distinctions between different animal-like protists. Include information about nutrition, locomotion, reproduction, and their pathogenic effects.

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FOR ACADEMIC YEAR 2023 AND ONWARDS

## Topic

10. Kingdom Animalia

## Total Periods

18

Sub-Topic	Range of SLOs	Periods (40 mins)
10.1 Introduction, 10.2 Criteria for Animal Classification 10.3 Phylum Porifera	10.1.1,10.2.1, 10.3.1,10.3.2	3
10.4 Grade Radiata Phylum Coelenterata 10.5 Grade Bilateria Triploblastic Animals-Acoelomates Phylum Platyhelminthes	10.4.1,10.4.2 10.5.1, 10.5.2 10.5.3	3  (1 practical unit)
10.6 Grade Bilateria Triploblastic Animals- Pseudocoelomates Phylum Aschelminthes (Nematoda), 10.7 Grade Bilateria Triploblastic Animals-Coelomates Phylum Annelida	10.6.1,10.6.2 10.7.1,10.7.3 10.7.3	3  (1 practical unit)
10.8 Phylum Arthropoda	10.8.1-10.8.3 10.8.4, 10.8.5	2
10.9 Phylum Mollusca	10.9.1-10.9.3	(2 practical units)
10.10 Phylum Echinodermata	10.10.1 10.11.1,10.12.1, 10.12.2,10.12.3	2

10.11 Phylum Hemichordata, 10.12 Phylum Chordata		
10.13 Sub-phylum Vertebrata	10.13.1-10.13.7	3 (2 practical units)
10.13 Sub-phylum Vertebrata	10.13.8-10.13.14	2

## Learning Resources

- A Textbook of Biology for grade XI by Sindh Textbook Board, Jamshoro
- Campbell & Reece Biology (8th or 9th Edition).
- Textbook of Biology Grade11 National Book Foundation as Federal Textbook Board, Islamabad

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Investigative Labs:

Provide microscopes, prepared slides and preserved specimens of different representatives of kingdom animalia in groups. Guide students in observing and identifying these slides and specimen. Ask them to draw labelled diagrams based on their observations.

### Activity 2:

#### Collaborative Learning:

After observing the slides and specimen, encourage them to exchange information with other groups. This collaborative approach facilitates learning and enhances students' ability to recognise and differentiate between different specimens.

### Activity 3:

#### Comparison Charts:

Compare different animals' phyla by using comparison charts, i.e., Venn diagram. Discuss the similarities and differences in terms of their habitat, type of symmetry, tissue organisation (diploblastic and triploblastic), body cavities (acoelomates, pseudocoelomates and coelomates), pattern of development (protostomes and deuterostomes), general characteristics and economic importance.

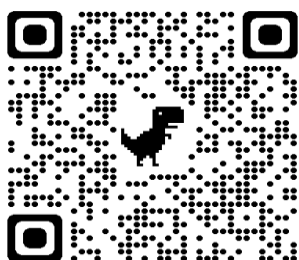
### Post Test Activity:

Following the completion of each phylum, distribute a post-test worksheet to the students. This will help assess their understanding and retention of the material covered in the phylum, providing a valuable feedback loop for their learning process.

## Further Resources

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## Topic

12. Nutrition

## Total Periods

8

Sub-Topic	Range of SLOs	Periods (40 mins)
12.2 Nutrition in Animals	12.2.1,12.2.2	1
	12.2.3,12.2.4	2
12.3 Nutrition in Non-Chordates	12.3.1-12.3.2	2
12.4 Digestion in Human Beings	12.4.1 -12.4.6	3

## Learning Resources

- A Textbook of Biology for grade XI by Sindh Textbook Board, Jamshoro
- Campbell & Reece Biology (8th or 9th Edition).
- Textbook of Biology Grade11 National Book Foundation as Federal Textbook Board, Islamabad

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Virtual Tours:

Utilise virtual tours or videos of the digestive system to provide a dynamic exploration of its components.

<https://www.youtube.com/watch?v=X3TAR0otFfM>

Create a visual flowchart that maps the journey of food from ingestion to elimination, highlighting key organs and processes.

## Activity 2:

### Interactive Models:

Use 3D models or interactive software to demonstrate the anatomical structures of the digestive system. Facilitate students to construct a concept map depicting the journey of food from ingestion to elimination, highlighting key organs and processes.

## Activity 3:

### Case Studies:

Present case studies of digestive disorders such as diarrhoea, dysentery, constipation, piles, dyspepsia, peptic ulcer and food poisoning to highlight the importance of the digestive system's proper functioning.

## Activity 4:

### Collaborative Projects:

Assign small groups to research about the nutrition of a specific animal such as amoeba, hydra, planaria and cockroach and present their findings to the class.

### 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/5ed3edfbf32f1b001be282f9/grade-11-enzymes-nutrition-and-digestion?fromSearch=true&source=null>

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## Topic

13.Gaseous exchange

## Total Periods

11

Sub-Topic	Range of SLOs	Periods (40 mins)
13.2 Gaseous Exchange in Animals	13.2.1-13.2.2	2
13.2 Gaseous Exchange in Animals	13.2.3-13.2.4	3
13.3 Respiratory System of Human Being	13.3.1	2
13.3 Respiratory System of Human Being	13.3.2-13.3.4	3
13.4 Respiratory Disorders	13.4.1-13.4.2	1

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Visual Aids and Diagrams:

Utilise diagrams, illustrations, and animations to visually represent the respiratory structures of various animals. Show how gases move in and out of different organisms, such as fish, insects, amphibians, birds, and mammals. Visual aids can help students grasp the diversity of adaptations for gaseous exchange.



## Activity 2:

### Comparative Approach:

Compare gaseous exchange mechanisms across different animal groups. Discuss the differences and similarities between aquatic and terrestrial organisms, as well as between those with lungs and those with tracheal systems. This approach helps students understand the advantages and limitations of various adaptations.

## Activity 3:

### Discussion and Q&A:

Encourage open discussions by asking thought-provoking questions. For instance, you could ask students to predict how changes in an animal's environment might affect its gaseous exchange efficiency or to consider what problems would be faced by a terrestrial animal having gills instead of lungs?

## Activity 4:

### Group Activities and Projects:

Assign group activities or projects that require students to research and present on different aspects of gaseous exchange and respiratory disorders. This encourages collaborative learning and allows students to delve deeper into specific areas of interest.

## Further Resources

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## Topic

## Total Periods

14. Transport

14

Sub-Topic	Range of SLOs	Periods (40 mins)
14.1 Introduction	14.1.1-14.2.1	1
14.6 Transportation in Animals	14.6.1 -14.6.3	1
14.6 Transportation in Animals	14.6.4 -14.6.6	1
14.7 Circulatory System of Human Beings	14.7.1-14.7.11	3
14.8 Cardiovascular Disorders	14.8.1-14.8.2, 14.8.3	2
14.9 Immune System	14.9.1 ,14.9.2, 14.9.3	3
	14.9.4, 14.9.5	3

## Learning Resources

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# **Suggested Activities and/or Formative Assessment**

## **Activity 1:**

### **Interactive Diagrams and Models:**

Use labelled diagrams, posters, and 3D models to illustrate the components of the circulatory system. Interactive digital models or apps can allow students to explore the system at their own pace, zooming in on specific structures and understanding their functions.

## **Activity 2:**

### **Videos and Animations:**

Show educational videos or animations that visually demonstrate blood circulation, heart anatomy, and the function of valves. These visual aids can make abstract concepts more comprehensible and engaging.

<https://www.youtube.com/watch?v=IS9TD9fHFv0>

<https://www.youtube.com/watch?v=RYZ4daFwMa8>

<https://www.youtube.com/watch?v=qmNCJxpsr0>

## **Activity 3:**

### **Dissections (Lab Activity):**

Dissections of hearts (goat/ sheep) or circulatory system components can offer a deeper understanding of the physical structures and their relationships. This requires careful preparation and follows safety guidelines.

## **Activity 4:**

### **Comparative Studies:**

Compare the human circulatory system with those of other animals to highlight evolutionary adaptations. Discuss the differences and similarities between single and double circulatory systems, as well as the various heart structures found in different organisms.

## **Activity 5:**

### **Group Projects and Presentations:**

Assign group projects where students research specific aspects of the circulatory system, such as the role of blood cells, blood types, or the effects of exercise on circulation. Have them present their findings to the class, fostering collaborative learning.

## Activity 6:

### Cross-Disciplinary Approach:

Integrate concepts from other subjects, such as physics (fluid dynamics of blood flow), biology (cellular respiration and waste removal), and chemistry (oxygen and carbon dioxide exchange).

## Activity 7:

### Field Trips and Guest Speakers:

Whenever possible, organise field trips to medical institutions or invite healthcare professionals to speak about their experiences with the circulatory system. This can provide real-world context and inspire students.

## Activity 8:

### Online Quiz:

<https://quizizz.com/admin/quiz/5e3afd363bd6ad001bcf9638/transport-in-humans?fromSearch=true&source=null>

## Further Resources

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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.

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