



آغا خان یونیورسٹی ایگزامینیشن بورڈ  
AGA KHAN UNIVERSITY EXAMINATION BOARD

## Pacing Guide for Teachers

# BIOLOGY

Grade IX

Theory

Number of weeks: 28

Number of periods per week: 3

Key Textbook: Textbooks of Biology for Grade IX and X by  
Punjab Textbook Board Lahore

Teacher Developer(s): Atia Akhtar and Nudrat Perveen

Institution(s): The Froebel's School, Karachi and The Mama  
Parsi Girls Secondary School, Karachi

## Topic

## Total Periods

1.Introduction To Biology

6

Sub-Topic	Range of SLOs	Periods (40 mins)
1.1 Introduction to Biology	1.1.1-1.1.2	1
1.2 Divisions and Branches of Biology 1.3 Relationship of Biology to Other Science Subjects 1.4 Scope of Biological Studies 1.5 Study of Life from the Perspective of the Holy Quran 1.6 Contribution of Scientists	1.2.1 -1.4.1 1.5.1,1.6.1	2
1.7 The Levels of Organisation	1.7.1-1.7.3	1
1.8 Unicellular and Multicellular Organisms	1.8.1-1.8.4	2

## 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.Solving a Biological Problem

## Total Periods

5

Sub-Topic	Range of SLOs	Periods (40 mins)
2.1 Biological Method	2.1.1-2.1.2	5

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Inquiry-based Project

Students can be presented with real-life problems, such as stomach-ache or cold symptoms, which require them to make observations, form hypothesis, and draw conclusions or deductions. The teacher may encourage them to work in groups to tackle these problems collaboratively. Use relatable and interesting real-world examples to illustrate the scientific method in action. This could involve discussing historical scientific discoveries or current events that were driven by the scientific method.

### Activity 2:

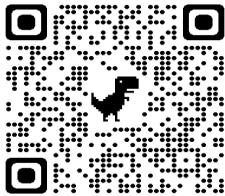
#### Concept Mapping

Concept mapping visually links scientific method steps—observation, question, hypothesis, experiment, data, analysis, conclusion—enhancing understanding. Students connect nodes, colour-code, and add details, promoting retention and logical flow comprehension. Encouraging collaboration, reflection, and sharing, concept maps become both teaching tool and assessment method, fostering critical thinking and engagement.

## Further Resources

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FOR ACADEMIC YEAR 2023 AND ONWARDS

## Topic

3.Biodiversity

## Total Periods

8

Sub-Topic	Range of SLOs	Periods (40 mins)
3.1 Introduction	3.1.1-3.1.2	1
3.2 Aims and Principles of Classification	3.2.1-3.2.2	1
3.3 History of Classification System 3.4 Units of Classification 3.6 Binomial Nomenclature	3.3.1-3.4.1 3.6.1	3
3.5 The Five Kingdom	3.5.1-3.5.2	1
	3.5.3-3.5.8	can be catered in practical
3.7 Conservation of Biodiversity	3.7.1-3.7.4	2

## Learning Resources

- Cambridge IGCSE Biology second edition by Maclean D.G (2nd Edition),
- Advanced Biology by Michael Kent Oxford University Press

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Family Tree Guess-Who

Students start by selecting a diverse range of organisms, each possessing distinct traits. Students then organise these organisms into a branching family tree, with

broader categories at the top and increasingly specific subcategories as they move down.

The core of the activity lies in the "Guess-Who" component. One student thinks of a specific organism on their tree, while others take turns asking yes-or-no questions to narrow down the possibilities. These questions are aimed at uncovering the defining traits of the chosen organism, highlighting the importance of key characteristics in classification.

As questions progress, students learn to distinguish between essential traits that lead to clear categorization and less crucial traits that do not serve as effective differentiators. They grasp the concept of shared ancestry and the hierarchical nature of taxonomy, comprehending how organisms are grouped based on evolutionary relationships and similarities.

## **Activity 2:**

### **Outdoor Exploration**

Take students on a nature walk or field trip to observe and collect various plants, insects, or other organisms. In the classroom, guide students in sorting and classifying the collected specimens based on observable features. Encourage discussions on the similarities and differences among the organisms and their taxonomic classifications.

## **Activity 3:**

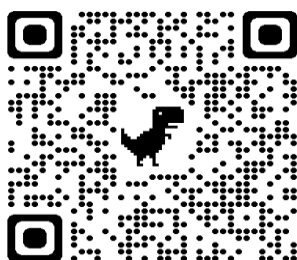
### **Create a Classification Chart**

Assign each student or group of students a specific taxonomic group (e.g., mammals, birds, reptiles). Instruct them to research and create a classification chart for their assigned group, including the major taxa and characteristic traits. Instruct students to present their classification charts to the class, explaining the rationale behind their categorisations. Facilitate a discussion on the similarities and differences between the different taxonomic groups.

## **Further Resources**

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## Topic

4.Cells and Tissues

## Total Periods

10

Sub-Topic	Range of SLOs	Periods (40 mins)
4.1 Microscopy and the Emergence of Cell Theory	4.1.1-4.1.2	2
4.2 Cellular Structures and Functions	4.2.1-4.2.5	4
	4.2.6-4.2.7	can be catered in practical
4.3 Active and Passive Transport of Matter	4.3.1-4.3.6	4
4.4 Tissues (Types of Plant and Animal Tissues)	4.4.1-4.4.5	can be catered in practical

## Learning Resources

- Advanced Biology by Michael Kent Oxford University Press
- Kwan Pang L. and Lam Eric YK (2004). Biology A course for “O Level.” Singapore: Federal Publication

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Cell Model Constructions

Have students create 3D models of plant and animal cells using various materials like clay, playdough, or craft supplies. Label and explain the function of each cellular structure they include.

## Activity 2:

### Cell Analogy Projects

Assign students to compare a cell to a familiar system, such as a city or a factory. They must explain how each organelle corresponds to different components in the chosen system.

## Activity 3:

### Tissue Collage

Ask students to create collages using pictures from magazines or online sources to represent various plant and animal tissues. They can label the tissues and explain their functions.

## Activity 4:

### Tissue Case Studies

Present case studies involving tissue-related issues, such as tissue damage or medical conditions. Students can analyse how tissues are affected and brainstorm potential solutions.

## Activity 5:

### Tissue Comparison Chart

Provide a chart for students to fill in, comparing and contrasting different plant and animal tissues in terms of structure, location, and function.

## Activity 6:

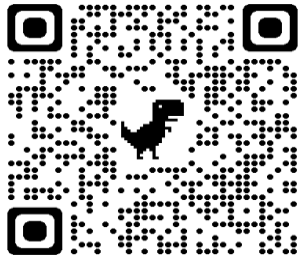
- Potato Osmosis Experiment + Steps:  
<https://www.youtube.com/watch?v=XDUJ7EoDFJA>
- Osmosis and Tonicity  
[https://www.youtube.com/watch?v=Y\\_w07A7chnk](https://www.youtube.com/watch?v=Y_w07A7chnk)
- <https://rwu.pressbooks.pub/bio103/chapter/membrane-transport/>



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FOR ACADEMIC YEAR 2023 AND ONWARDS

## Topic

5.Gaseous Exchange

## Total Periods

5

Sub-Topic	Range of SLOs	Periods (40 mins)
5.1 Introduction 5.2 Gaseous Exchange in Plants	5.1.1-5.2.1	1
5.3 Gaseous Exchange in Human Beings	5.3.1-5.3.6	3
5.4 Respiratory Disorders	5.4.1-5.4.2	1

## Learning Resources

- Kwan Pang L. and Lam Eric YK (2004). Biology A course for “O Level.” Singapore: Federal Publication
- Advanced Biology by Michael Kent Oxford University Press

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Lung Model Demonstration

Create a simple lung model using balloons and plastic bottles to demonstrate how the diaphragm and rib muscles work during inhalation and exhalation.

### Activity 2:

#### Breathing Rate Measurement

Guide students to measure their resting breathing rates and then engage in different activities (walking, running) to observe how gaseous exchange varies with physical activity.

## Activity 3:

### Case Studies

Provide students with case scenarios of individuals suffering from different respiratory disorders such as asthma, chronic bronchitis, or pneumonia. Have them analyze symptoms, causes, and potential treatments.

## Activity 4:

### Research and Presentation

Assign students specific respiratory disorders to research. They can create presentations or informative posters detailing the disorder's causes, symptoms, diagnosis, and management.

## Activity 5:

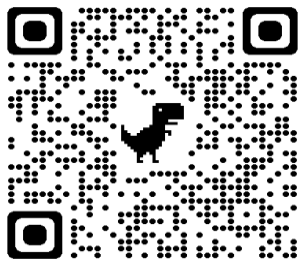
### Patient Education Materials

Assign students to create educational brochures or infographics explaining a specific respiratory disorder to patients and their families.

## Further Resources

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## Topic

6.Enzymes

## Total Periods

6

Sub-Topic	Range of SLOs	Periods (40 mins)
6.1 Characteristics of Enzymes	6.1.1-6.1.8	3
6.2 Factors Affecting Activity of Enzymes	6.2.1-6.2.2	2
6.3 Mechanism of Enzyme Action	6.3.1-6.3.2	1

## Learning Resources

- Advanced Biology by Michael Kent Oxford University Press
- IGCSE Biology Course book Second edition

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Lab Activity

While demonstrating practical activities related to enzyme action, encourage students to relate concept with practical activity.

### Activity 2:

#### Enzyme Experiment Reflection

After conducting enzyme activity experiments, have students reflect on their findings. Ask them to explain how their observations align with the principles of enzyme function.

### Activity 3:

#### Enzyme Modelling

Using building materials (Play-Doh), have students create 3D models of enzymes and substrates, demonstrating the concept of enzyme-substrate interactions.

## Activity 4:

### Enzyme Kinetics Graphing

Provide students with enzyme kinetics data and guide them in creating graphs that illustrate how factors like substrate concentration or temperature influence reaction rates.

## Activity 5:

### Lock-and-Key Puzzle

Create a puzzle where students match enzyme shapes (keys) to substrate shapes (locks). As they solve the puzzle, explain how this mimics the specificity of enzyme-substrate interactions.

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## Topic

7.Bioenergetics

## Total Periods

12

Sub-Topic	Range of SLOs	Periods (40 mins)
7.1 Bioenergetics	7.1.1-7.1.4	2
7.2 Photosynthesis	7.2.1-7.2.5	3
	7.2.6	1
7.3 Factors Affecting Rate of Photosynthesis	7.3.1-7.3.2	2 Will also be catered in practical
7.4 Respiration in Human Beings	7.4.1-7.4.8	4

## Learning Resources

- Kwan Pang L. Biology A course for O Level
- Advanced Biology by Michael Kent Oxford University Press

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Lab Activity

Teachers can ask students to perform different practical from their textbooks to understand the necessity of different factors that affect the rate of photosynthesis.

## Activity 2:

### ATP Collage

Ask students to create collages using images representing cellular activities that require ATP. Discuss how ATP fuels these processes and why it's considered a currency.

## Activity 3:

### Photosynthesis Data Analysis

Provide students with data sets of photosynthesis rates under different conditions. Have them analyse and interpret the data to draw conclusions about the impact of each factor.

## Activity 4:

### Concept mapping

It is a visual teaching strategy that enhances understanding of the photosynthesis mechanism and cellular respiration. Guide students to create concept map illustrating interconnectedness among different concepts.

## Activity 5:

### Respiration Infographics

Assign groups to design infographics that visually present the key steps and molecules involved in both aerobic and anaerobic respiration, highlighting energy production.

## Further Resources

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## Topic

8.Nutrition and Digestion

## Total Periods

13

Sub-Topic	Range of SLOs	Periods (40 mins)
8.1 Mineral Nutrition in Plants	8.1.1-8.1.4	2
	8.1.5-8.1.6	1
8.2 Components of Human Food	8.2.1-8.2.6	3
8.3 Balanced Diet 8.4 Problems Related to Nutrition	8.3.1-8.4.2	2
8.5 Ingestion, Digestion and Absorption of Food in Human Beings	8.5.1-8.5.4	2
8.5 Ingestion, Digestion and Absorption of Food in Human Beings 8.6 Disorders of Gut	8.5.5-8.6.1	3

## Learning Resources

- Kwan Pang L. Biology A course for O Level
- Advanced Biology by Michael Kent Oxford University Press



# Suggested Activities and/or Formative Assessment

## Activity 1:

### Digestive System Model

Use a physical model of the digestive system to demonstrate the path of food from the mouth to the small intestine. Explain each organ's role and engage students by letting them interact with the model.

## Activity 2:

### Digestive System Diagrams

Provide blank diagrams of the digestive system for students to label and annotate with explanations of each organ's function.

## Activity 3:

### Food Journey Storytelling

Ask students to write a creative narrative describing the journey of a piece of food through the digestive system. Emphasize the changes and processes at each stage.

## Activity 4:

### Digestive Case Studies

Present real-world scenarios involving digestive issues or diseases. Have students analyse symptoms and explain how they relate to disruptions in the digestive process.

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## Topic

9.Transport

## Total Periods

19

Sub-Topic	Range of SLOs	Periods (40 mins)
9.1 Introduction 9.2 Transport in Plants	9.1.1-9.3.1	4
9.3 Transpiration	9.3.2-9.3.8	3
	9.3.9	1
9.4 Transport in Animals; Blood	9.4.1-9.4.2	1
	9.4.3-9.4.6	3
9.5 Human Heart	9.5.1-9.5.6	3
9.6 Blood Vessels	9.6.1-9.6.2	1
General Plan of Human Blood Circulatory System	9.7.1-9.7.4	2
Cardiovascular Disorders	9.8.1-9.8.2	1

## Learning Resources

- Kwan Pang L. and Lam Eric YK (2004). Biology A course for “O Level”.
- Singapore: Federal Publication.
- Mackean D. G. (2nd Edition). IGCSE Biology. Hodder Education. London.
- Advanced Biology by Michael Kent Oxford University Press

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Concept mapping/ flow charts development

Encourage students to develop concept maps or flow charts to depict their comprehension.

### Activity 2:

#### Heart Model Exploration

Provide 3D heart models for hands-on exploration. Students can manipulate the chambers, valves, and blood vessels to understand the heart's structure.

### Activity 3:

#### Heartbeat Sound Activity

Let students listen to and analyse the sounds of a heartbeat using a stethoscope or digital audio clips. Discuss how these sounds correspond to different heart valves' movements.

### Activity 3:

#### Heart Health Case Studies

Present real-life cases related to heart health, such as cardiac diseases. Students analyze symptoms and discuss how the heart's structure affects its function.

### Activity 4:

#### Heart Function Animation

Show animated videos explaining how blood flows through the heart, focusing on the movement of oxygenated and deoxygenated blood and the role of valves.

### Activity 5:

#### Blood Component Sorting

Provide labelled images of blood components. Have students work individually or in groups to sort and categorize the different elements, discussing their roles.

## Activity 6:

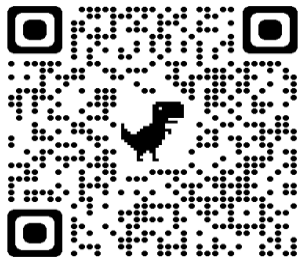
### Blood Type Identity Collage

Have students create collages representing their own blood types. They can include images, symbols, and information about their ABO blood group.

### Further Resources

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FOR ACADEMIC YEAR 2023 AND ONWARDS

**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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