



آغا خان یونیورسٹی ایگزامینیشن بورڈ  
AGA KHAN UNIVERSITY EXAMINATION BOARD

## Pacing Guide for Teachers

# BIOLOGY

Grade X

Theory

Number of weeks: 28

Number of periods per week: 3

Key Textbook: Textbooks of Biology for 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  
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## Topic

10.Cell Cycle

## Total Periods

9

Sub-Topic	Range of SLOs	Periods (40 mins)
10.1 Cell Cycle (Interphase and Division)	10.1.1-10.1.4	1
	10.1.5-10.1.6	1
10.2 Mitosis	10.2.1-10.2.4	2
	10.2.5-10.2.7	1
10.3 Meiosis	10.3.1-10.3.4	3
10.4 Necrosis and Apoptosis	10.4.1	1

## Learning Resource

Advanced Biology by Michael Kent Oxford University Press

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Model Making

Ask students to make 3D model of different stages of mitosis in groups. They will construct replicas of cells in various stages of mitosis and cytokinesis, reinforcing their understanding of the cell cycle's key phases and the process of cellular replication.

## Peer Review

The teacher can ask students to review each group's work. This can help students to learn from each other. Teachers can also take a one-minute presentation on different stages of mitosis to understand the knowledge of their students.

## Cell Cycle Diagram Activity

Provide students with a blank cell cycle diagram and labels for different phases (interphase, mitosis, cytokinesis). Have them label and colour-code the diagram to demonstrate their understanding of each phase's characteristics and sequence.

## Activity 2:

### Interactive Online Simulations

Use online interactive simulations to visually illustrate the cell cycle. Students can manipulate the simulation to see how cells progress through different phases.

<https://vcell.science/project/meiosis>

[https://www.labxchange.org/library/items/lb:LabXchange:f1fb8ad9:lx\\_image:1](https://www.labxchange.org/library/items/lb:LabXchange:f1fb8ad9:lx_image:1)

## Activity 3:

### Concept Mapping

Have students create concept maps that illustrate the different stages of cell division, the structures involved, and the key events that occur. This assessment method assesses their ability to organize and synthesize their knowledge of cell division.

## 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

11.Homeostasis

## Total Periods

11

Sub-Topic	Range of SLOs	Periods (40 mins)
11.1 Introduction 11.2 Homeostasis in Plants	11.1.1-11.2.2	2
11.3 Homeostasis in Human Beings	11.3.1-11.3.2	2
	11.3.3-11.3.4	1
11.4 Urinary System of Human Beings	11.4.1-11.4.5	4
11.5 Disorders of Human Excretory System	11.5.1-11.5.5	2

## 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:

#### Stem Activity

<https://fit.sanfordhealth.org/resources/stem-activity-learning-about-kidneys-video>

(This video help students to understand the functioning of the kidney)

## Activity 2:

### Smart Board Assessment

With the help of smart board activity teachers can assess their students by asking labelling of diagrams, functioning of different parts of the kidney. This will help the students to learn the topic quickly.

## Activity 3:

### Plant Field Trip or Virtual Tour

Organise a field trip to a botanical garden or a nature reserve showcasing different types of plant (xerophytes, hydrophytes and halophytes). Alternatively, provide a virtual tour with detailed images and descriptions of each plant's habitat and adaptations.

## 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

12.Coordination and Control

## Total Periods

13

Sub-Topic	Range of SLOs	Periods (40 mins)
12.1 Introduction 12.2 Types of Coordination (Nervous and Chemical Coordination)	12.1.1-12.2.3	2
12.3 Human Nervous System	12.3.1-12.3.3	2
	12.3.4-12.3.6	1
	12.3.7-12.3.8	1
12.4 Receptors of Human (Eye and Ear)	12.4.1-12.4.6	3
12.5 Endocrine System	12.5.1-12.5.5	3
12.6 Nervous Disorders	12.6.1-12.6.2	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:**

### **Brain, Ear and Eye Models,**

Provide students with a 3D brain ear and eye models that are present in your laboratory or use virtual tools to explore the different parts of each organ.

## **Activity 2:**

### **Brain Injury Case Studies**

Discuss case studies of individuals with brain injuries affecting specific areas. Allow students to analyse the consequences of the injuries on behaviour, cognition, and motor skills.

## **Activity 3:**

### **Spinal Cord Injury Case Studies**

Allow students explore the challenges of spinal cord injuries by using wheelchairs or wearing weights to simulate mobility restrictions. Discuss the role of the spinal cord in transmitting signals.

## **Activity 4:**

### **Diagram Labeling**

Provide students with diagrams of the brain, eye, or ear and ask them to identify and label the different structures. This assessment method tests their ability to recognize and recall the anatomical features accurately.

## **Activity 5:**

### **Pupil Reflex Simulation**

Use a flashlight to mimic the pupil's response to varying light levels. Have students observe the pupil's size changing in response to the light, discussing the role of the iris.

## **Activity 6:**

### **Comparison Chart**

Create a comparison chart that lists the major endocrine glands, their hormones, functions, and target organs. This visual representation helps students understand the diversity of hormones and their effects.

## Activity 7:

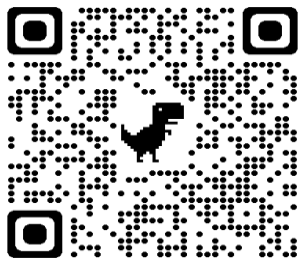
### Endocrine System Story

Craft a story where each endocrine gland is a character with unique traits and functions. Students can visualize how these "characters" work together to maintain balance in the body.

### Further Resources

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FOR ACADEMIC YEAR 2023 AND ONWARDS



## Topic

13.Support and Movement

## Total Periods

7

Sub-Topic	Range of SLOs	Periods (40 mins)
13.1 Human Skeleton (Axial and Appendicular Skeleton)	13.1.1-13.1.6	2
13.2 Types of Joints 13.3 Muscles and Movement	13.2.1-13.3.3	3
13.4 Disorders of Skeletal System	13.4.1	1
13.5 Movement in Plants	13.5.1-13.5.2	1

## Learning Resources

- D. G. (2nd Edition). IGCSE Biology. Hodder Education. London.
- Advanced Biology by Michael Kent Oxford University Press

## Web Resource

<https://www.youtube.com/watch?v=nP9msHiGkBU>

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

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Joint Classification Chart

Provide students with a chart listing various joints in the body (e.g., ball-and-socket, hinge, pivot). Have them categorize each joint type based on its structure and range of motion. Discuss as a class.

## Activity 2:

### Joint Movement Mime

Assign different students or groups one type of joint each. They perform mimes to demonstrate the movements possible at that joint (e.g., swinging arm for hinge joint). Classmates guess the joint type.

## Activity 3:

### Joint Flexibility Exercises

In pairs, students demonstrate the range of motion of specific joints. For example, they can demonstrate hinge joints by mimicking elbow movements or ball-and-socket joints by simulating hip rotations.

## Activity 4:

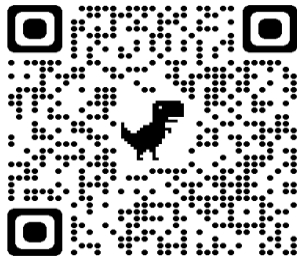
### Quick Response Assessment

Teacher can ask students to write a short response to a question at the end of the class. This will help the teacher to quickly assess the student's understanding.

## Further Resources

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## Topic

14.Reproduction

## Total Periods

12

Sub-Topic	Range of SLOs	Periods (40 mins)
14.1 Introduction 14.2 Asexual Reproduction in Protists, Bacteria and Plants 14.5 Asexual Reproduction in Animals	14.1.1-14.2.1 14.5.1	2
14.2 Asexual Reproduction in Protists, Bacteria and Plants	14.2.2-14.2.6	3
14.3 Sexual Reproduction in Plants (Pollination and Fertilisation)	14.3.1-14.3.4	3
14.4 Germination of Seed	14.4.1-14.4.3	1
14.6 Sexual Reproduction in Animals	14.6.1-14.6.4	2
14.7 Sexually Transmitted Disease (STD)	14.7.1	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:**

### **Seed Germination Observation**

Provide students with seeds (beans, peas, etc.) and have them germinate the seeds in different conditions (light vs. dark, wet vs. dry). Students can document and sketch the stages of germination.

## **Activity 2:**

### **Flower Dissection**

Provide flowers for dissection and exploration. Students observe and identify the various parts (petals, sepals, stamens, pistil) and discuss their functions in reproduction.

## **Activity 3:**

### **Stem Cutting**

Provide students with cuttings from different plants stem. They prepare the cuttings, pot them and monitor their growth. Discuss how artificial cutting propagation works.

## **Activity 4:**

### **Field Trip or Botanical Garden Visit**

Arrange a field trip to a botanical garden or local park where students can observe a variety of plants and their reproductive structures. Guide them to identify different flower types, pollinators, and seed dispersal mechanisms. Encourage them to make observations and ask questions about plant reproduction.

## **Activity 5:**

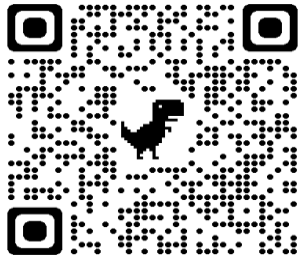
### **Online Quiz**

[https://quizizz.com/admin/search/Quiz%20on%20reproduction%20in%20plants?contentTypes=\[%22quiz%22,%22presentation%22\]](https://quizizz.com/admin/search/Quiz%20on%20reproduction%20in%20plants?contentTypes=[%22quiz%22,%22presentation%22])

## Further Resources

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FOR ACADEMIC YEAR 2023 AND ONWARDS

## Topic

15.Inheritance

## Total Periods

11

Skill/ Topic	Range of SLOs	Periods (40 mins)
15.1 Introduction 15.2 Chromosomes and Genes	15.1.1-15.2.5	2
15.3 Mendel's Law of Segregation and Independent Assortment	15.3.1-15.3.4	3
	15.3.5 -15.3.8	2
15.4 Variation and Evolution	15.4.1-15.4.3	2
	15.4.4-15.4.7	2

## Learning Resources

- Kwan Pang L. A Course for O' level Biology
- Advanced Biology by Michael Kent Oxford University Press
- Mackean D. G. (2nd Edition). IGCSE Biology. Hodder Education. London.

## Suggested Activities and/or Formative Assessment

### Activity 1:

Candy DNA Model

[Make A Candy DNA Model | STEM Activity \(sciencebuddies.org\)](https://www.sciencebuddies.org/STEM-Activity/make-a-candy-dna-model)

## Activity 2:

### Trait Surveys

Conduct a class-wide survey to collect data on specific traits among students, such as hair color, eye color, or tongue rolling. Students can compile and analyze the data, identifying patterns and applying Mendel's laws to explain the inheritance of these traits.

## Activity 3:

### Genotype and Phenotype Sorting

Prepare sets of genotype and phenotype cards representing different traits. Ask students to sort the genotypes and phenotypes.

## Activity 4:

### Two-Trait Punnett Square

Introduce two traits (e.g., flower colour and height) and provide different coloured beads for alleles. Students create Punnett squares to predict the combinations of traits in offspring.

## Further Resources

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## Topic

16.Man and his Environment

## Total Periods

10

Sub-Topic	Range of SLOs	Periods (40 mins)
16.1 The Ecosystem: Levels of Ecological Organisation; Components	16.1.1-16.1.2	1
16.2 Flow of Materials and Energy in the Ecosystem	16.2.1-16.2.5	3
16.3 Biogeochemical Cycles (Carbon and Nitrogen Cycle)	16.3.1-16.3.3	2
16.4 Interactions in the Ecosystem (Competition, Predation, Symbiosis)	16.4.1-16.4.2	1
16.5 Human Impact on the Environment	16.5.1	1
16.6 Pollution, its Consequences and Control 16.7 Conservation of Resources	16.6.1-16.7.1	2

## Learning Resource

- Kwan Pang L. A Course for O' level Biology
- Advanced Biology by Michael Kent Oxford University Press
- Maclean D. G. (2nd Edition). IGCSE Biology. Hodder Education. London.



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

## **Activity 1:**

### **Field Trip or Nature Walk**

Organize a field trip to a local ecosystem, such as a forest, wetland, or grassland. During the visit, guide students to observe and document the interactions between organisms and the flow of materials and energy. Encourage them to take notes, draw diagrams, or create sketches to represent their observations.

## **Activity 2:**

### **Construction of Chains and Web**

Teachers can ask students to construct food chains and webs by the organisms which they have observed in the ecosystem and draw their pyramids.

## **Activity 3:**

### **Visual Aids and Diagrams**

Use diagrams, flowcharts, and visual representations to illustrate the cycles' stages and interactions. These visuals help students conceptualise the movement of elements and compounds through different reservoirs.

## **Activity 4:**

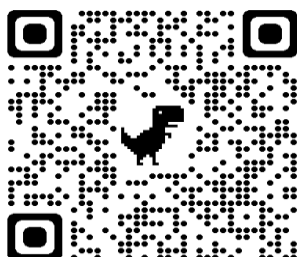
### **Concept Mapping**

Encourage students to create concept maps that illustrate the interconnectedness of different elements, processes, and organisms within the cycles. This helps them visualize the complexity of the systems.

## **Further Resources**

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## Topic

17.Biotechnology

## Total Periods

6

Sub-Topic	Range of SLOs	Periods (40 mins)
17.1 Introduction	17.1.1-17.1.2	1
17.2 Fermentation and Baking Industry	17.2.1-17.2.4	2
17.3 Genetic Engineering	17.3.1-17.3.4	2
17.4 Single Cell Protein and its Uses	17.4.1-17.4.2	1

## Learning Resources

- Kwan Pang L. A Course for O' level Biology
- Advanced Biology by Michael Kent Oxford University Press
- Maclean D. G. (2nd Edition). IGCSE Biology. Hodder Education. London

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Concept Mapping

Guide students in creating concept maps that show the steps of genetic engineering and how they relate to different applications.

### Activity 2:

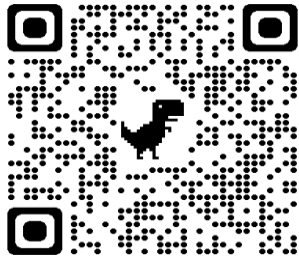
#### Multimedia Resources

Incorporate videos, documentaries, and podcasts that showcase genetic engineering techniques, real-world applications, and interviews with experts.

## Further Resources

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



FOR ACADEMIC YEAR 2023 AND ONWARDS

## Topic

18. Pharmacology

## Total Periods

5

Sub-Topic	Range of SLOs	Periods (40 mins)
18.1 Introduction	18.1.1.-18.1.6	2
18.2 Medicinal Drugs and Addictive Drugs	18.2.1-18.2.6	2
18.3 Antibiotics and Vaccines	18.3.1-18.3.4	1

## Learning Resource

- Kwan Pang L. A Course for O' level Biology
- Advanced Biology by Michael Kent Oxford University Press

## Suggested Activities and/or Formative Assessment

### Activity 1:

#### Real-Life Examples

Present case studies or real-life examples of antibiotic-resistant bacteria outbreaks. Discuss the impact on healthcare, highlighting instances where once-effective antibiotics are no longer effective.

### Activity 2:

#### Explaining Resistance Mechanisms

Introduce common mechanisms of resistance, such as mutations in target genes, efflux pumps, and enzyme production that inactivate antibiotics.

Use visuals, animations, and analogies to help students understand how these mechanisms work at the molecular level.

## 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.

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