آغا خان یونیورسٹی ایگزامینیشن بورڈ

AGA KHAN UNIVERSITY EXAMINATION BOARD

Pacing Guide for Teachers

BIOLOGY (ZOOLOGY)

Grade XII

Theory

Number of weeks: 28

Number of periods per week: 3

Key Textbook: Biology for Grade 12, Punjab Textbook Board, Lahore

Teacher Developer(s): Musarrat Jabeen Lubna

Institution(s): Habib Public School, Karachi

Topic	Total Periods
Homeostasis	13

Sub-Topic	Range of SLOs	Periods (40 mins)
15.1 Introduction, 15.2 Feedback System	15.1.1-15.1.2, 15.2.1-15.2.3	2
15.3 Osmoregulation in Plants and Animals	15.3.4	1
15.5 Excretion in Animals	15.5.1-15.5.2	2
15.6 Excretion in Man	15.6.1- 15.6.7	3
15.7 Kidney Problems	15.7.1,15.7.2	2
15.9 Thermoregulation in Animals	15.9.1-15.9.5	3

Learning Resources

- A Textbook of Biology for grade XII by Sindh Textbook Board, Jamshoro
- Textbook of Biology Grade12 National Book Foundation as Federal Textbook Board, Islamabad
- Campbell, Reece. Biology (A Global Approach, Tenth Edition)

Suggested Activities and/or Formative Assessment

Activity 1

Animated Videos:

Share animated videos that visually explain how the counter-current mechanism establishes a concentration gradient in the nephron, leading to water reabsorption.

https://www.youtube.com/watch?v=XbI8eY-BeXY

https://www.youtube.com/watch?v=chARqnvMRjM

https://www.youtube.com/watch?v=pIx9Phx9C04

Activity 2

Whiteboard Demonstrations:

Use a whiteboard or digital board to draw out the loop of Henle and illustrate the movement of solutes and water at different segments.

Activity 3

Critical Thinking Questions:

Pose thought-provoking questions that encourage students to predict the outcomes of changes in the loop of Henle's structure or function, i.e., Consider the scenario where the loop of Henle's thin descending limb became more permeable to solutes. How could this affect the osmolarity of the filtrate at the end of the loop?

Activity 4

Students' Assessment Quiz:

https://quizizz.com/admin/quiz/5e2a1473dfb3d1001bec1e3b/homeostasis?fromSearch=true&source=null

https://quizizz.com/admin/quiz/5bc7fee3fe9995001b08aff9/homeostasis?fromSearch=true&source=null

https://quizizz.com/admin/quiz/6435b043b21713001d759882/kidney-homeostasis?fromSearch=true&source=null

https://quizizz.com/admin/quiz/5f14ffd5c2b85a001b523de3/homeostasis-in-animals-and-plants?createdByMe=true&searchLocale

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
16. Support and Movement	13

Sub-Topic	Range of SLOs	Periods (40 mins)
16.3 Support and Locomotion in Animals	16.3.1-16.3.3	2
16.4 Human Skeleton	16.4.1, 16.4.5, 16.4.6	2
	16.4.2-16.4.4	2 (Practical units)
16.4 Human Skeleton	16.4.7-16.4.9	2
16.5 Muscular System	16.5.1-16.5.3	2 (Practical units)
16.5 Muscular System	16.5.5 - 16.5.9	4
16.6 Locomotion in Protozoa and Animals	16.6.1-16.6.4	3

Learning Resources

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- Campbell, Reece. Biology (A Global Approach, Tenth Edition)

Web Resources

https://www.youtube.com/watch?v=NfEJUPnqxk0

Suggested Activities and/or Formative Assessment

Activity 1

Visual Guides:

Use labelled diagrams, models and illustrations to showcase the bones of the axial and appendicular skeleton. Point out key features, bone names and articulation.

Activity 2

Comparative Skeletons:

Compare the skeletal structures of different species to highlight adaptations related to movement, support, and environmental factors.

Activity 3

Visual Demonstrations:

Models:

Provide joint models or images that demonstrate the various types of joints (ball-and-socket, hinge, pivot, etc.). Explain the range of motion associated with each.

Interactive Videos:

Share videos that show animations of joint movements, muscle structure and mechanism of muscle contraction. These visual aids can help students understand the subject matter more efficiently.

https://www.youtube.com/watch?v=Un_iG74R_TI

https://www.youtube.com/watch?v=fEgjXKvO6A4

https://www.youtube.com/watch?v=BVcgO4p88AA

https://www.youtube.com/watch?v=GrHsiHazpsw

Joint Diagrams:

Provide diagrams of joints, highlighting ligaments, synovial fluid, and other structures that contribute to joint stability and mobility.

Activity 4

Quiz:

https://quizizz.com/admin/quiz/62578c1f92d1e7001e667b99/muscle-contraction?allQuizzes=true&searchLocale

https://quizizz.com/admin/quiz/5fc1d987a9fdc9001f0b16a0/chapter-14-support-movement-in-humans-animals?fromSearch=true&source=null

Activity 5

Lab Activity:

Assist students to prepare temporary slides of skeletal, smooth, and cardiac muscle tissues. It helps students understand the differences in structure and function of these muscle types.

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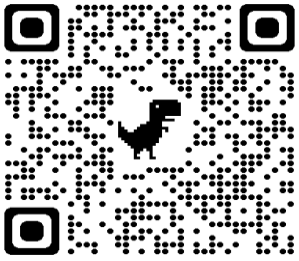

Topic	Total Periods
17. Coordination & Control	17

Sub-Topic	Range of SLOs	Periods (40 mins)
17.1 Introduction, 17.3 Coordination in Animals	17.1.1,17.1.2 17.3.1-17.3.4	2
17.3 Coordination in Animals	17.3.5-17.3.10	3
17.4 Evolution of Nervous System	17.4.1- 17.4.5	3
17.4 Evolution of Nervous System, 17.5 Chemical Coordination	17.4.6-17.4.7 17.5.1	3
17.5 Chemical Coordination	17.5.2-17.5.5	3
17.6 Behaviour	17.6.1-17.6.4	3

Learning Resources

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- Campbell, Reece. Biology (A Global Approach, Tenth Edition)

Suggested Activities and/or Formative Assessment

Activity 1

Visual Demonstrations via Animations:

Provide animated visualisations of complex concepts, including the propagation of an action potential along an axon, the components of the brain, and the mechanism of a reflex arc.

https://www.youtube.com/watch?v=iBDXOt_uHTQ

https://www.youtube.com/watch?v=OvVl8rOEncE

https://www.youtube.com/watch?v=z4U6uqm4s-o

https://www.youtube.com/watch?v=mELWDukIDuQ

https://www.youtube.com/watch?v=LNB_--I1vik

Activity 2

Action Potential Graphs:

Show graphs depicting the changes in voltage (action potential) over time during depolarisation and repolarisation. Explain how sodium and potassium channels play a role.

Activity 3

Signal Interruption Scenario:

Present a scenario where a certain component of the neuron is impaired, such as myelin sheath damage. Ask students to predict the impact on nerve impulse conduction.

Scenario-based questions:

Provide diverse scenario-based questions in the form of worksheets to facilitate the understanding of various types of learning behaviours in animals.

Activity 4

Group Activities:

Hormone Role-Play:

Assign students roles as different hormones and target organs. Have them interact in a simulated hormone-receptor binding scenario to demonstrate understanding.

Hormone Research Projects:

Divide students into groups and assign each group a specific hormone to research. Have them present on the hormone's production, functions, and effects.

Activity 5

Home Assignment online Quiz

https://quizizz.com/admin/quiz/5eba468714b141001bad744c/control-and-coordination?fromSearch=true&source=null

https://fgstudy.com/quiz/12th-class/chapter-wise/12th-class-biology-mcqs-coordination-and-control-online-test.html

https://drive.google.com/file/d/1DwTh8IGMSX_eRWt4vHkVUVl9JM_zVICz/view

Further Resources

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Topic	Total Periods
18. Reproduction	10

Sub-Topic	Range of SLOs	Periods (40 mins)
18.5 Asexual Reproduction in Animals	18.5.1-18.5.2	2
18.6 Sexual Reproduction in Animals	18.6.1-18.6.4 18.6.5-18.6.8	3 3
	18.6.9 -18.6.12	2

Learning Resources

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Suggested Activities and/or Formative Assessment

Activity 1

Students Activity

Visual Aids:

Anatomical Diagrams: Use detailed diagrams to illustrate the male and female reproductive systems. Highlight the structures and their relationships.

3D Models: Provide three-dimensional models of reproductive organs to help students visualize their spatial arrangement.

Menstrual Cycle Diagrams:

Use labelled diagrams to illustrate the stages of the menstrual cycle, including follicular, ovulation, and luteal phases. Highlight hormone fluctuations and changes in the uterine lining.

Activity 2

Guest Speakers and Experts:

Invite guest speakers, such as gynecologists or reproductive health educators, to share real-world insights and answer students' questions.

Activity 3

Home Assignment Quiz

https://quizizz.com/admin/quiz/64226304492eb5001db17e2b/reproduction-in-humans-the-menstrual-cycle

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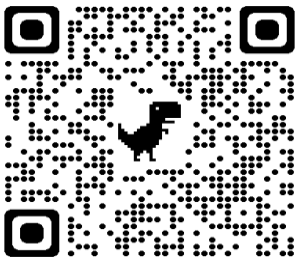

Topic	Total Periods
19. Growth and Development	8

Sub-Topic	Range of SLOs	Periods (40 mins)
19.1 Introduction, 19.4 Growth and Development in Animals, 19.5 Development of Chick	19.1.1, 19.4.1-19.4.2 19.5.1	2
19.5 Development of Chick	19.5.2 19.5.3 -19.5.4	3 (1 Lab unit)
19.6 Cell Differentiation and its Mechanism, 19.7 Abnormal Development	19.6.1-19.6.6 19.7.1,19.7.2	3

Learning Resources

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Suggested Activities and/or Formative Assessment

Activity 1

Embryology Charts:

Use detailed diagrams and charts that depict the developmental stages of a chick embryo inside the egg.

Activity 2

Embryonic Development Animations:

Share animated videos that illustrate the various stages of chick development, from fertilization to hatching.

https://www.youtube.com/watch?v=-Oay7q_xw9U

https://www.youtube.com/watch?v=jsFn-_SC2Q8

https://www.youtube.com/watch?v=OPTmFxtivHI

https://www.youtube.com/watch?v=rSIurckMtfU

Activity 3

Graphic Organisers:

Provide students with graphic organiser like concept maps, KWL charts (What I Know, What I Want to Know, What I Learned), or Venn diagrams to visually organise and compare information from the videos.

Further Resources

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Topic	Total Periods
23. Biotechnology	13

Sub-Topic	Range of SLOs	Periods (40 mins)
23.1 Introduction to Biotechnology 23.2 Genetic Engineering	23.1.1-23.1.2 23.2.1	2
23.2 Genetic Engineering	23.2.2	3
23.3 Applications of Genetic Engineering	23.3.1- 23.3.2	2
23.4 Biotechnology and Health	23.4.1-23.4.2	2
23.4 Biotechnology and Health	23.4.3- 23.4.4	2
23.5 Biotechnology and Agriculture	23.6.1,23.6.2,23.6.3	2

Learning Resources

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Suggested Activities and/or Formative Assessment

Activity 1

Flowcharts and Diagrams:

Use flowcharts and diagrams to illustrate the sequential steps of genetic engineering, including DNA isolation, gene insertion, and cloning.

Activity 2

Case Studies and Applications:

Real-Life Examples: Discuss real-world applications of genetic engineering, such as genetically modified organisms (GMOs) in agriculture and medical applications like insulin production.

Ethical Considerations: Engage students in discussions about the ethical implications of genetic engineering, considering both potential benefits and risks.

Forensic DNA Profiling: Present a case study on how PCR is used in forensic DNA profiling, highlighting its role in identifying individuals.

Archaeological DNA Analysis: Explore how PCR is used to amplify ancient DNA samples in archaeological research.

Activity 3

Visual Aids:

https://www.youtube.com/watch?v=DIM38NlkWEo

https://www.youtube.com/watch?v=CvJNzxvPCzg

Activity 4

Ethical Discussions:

DNA Fingerprinting Ethics: Engage students in discussions about the ethical considerations surrounding DNA fingerprinting and the potential misuse of genetic information.

Activity 5

Quiz:

https://quizizz.com/admin/quiz/5a79baca68cc71001f1d0a3d/genetic-technology?isSuperRecommeded=false

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Topic	Total Periods
24. Evolution	6

Sub-Topic	Range of SLOs	Periods (40 mins)
24.1 Introduction	24.1.1- 24.1.3	1
24.2 Theories of Evolution	24.2.1- 24.2.3	2
24.3 Evidence of Evolution	24.3.1 - 24.3.2	1
24.4 Mechanism of Evolution	24.4.1 - 24.4.8	2

Learning Resources

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Suggested Activities and/or Formative Assessment

Activity 1

Engage with Natural Selection via Beak Adaptation Lab:

Provide different types of tools or utensils (e.g., tweezers, chopsticks, clothespins) and a variety of "foods" (e.g., beans, marshmallows).
Assign different beak shapes to student groups and have them test which tool is most efficient for picking up specific foods.
Discuss how the tool (beak) suited to the food source represents an adaptation.
Debrief the activity by facilitating discussions that connect the activity to the concept of natural selection. Encourage students to explain their decisions, reflect on the outcomes, and draw parallels to real-world scenarios.

Activity 2

Mathematical Practice of Hardy-Weinberg Law:

Provide a set of allele frequency data and have students practice calculating genotype frequencies using the Hardy-Weinberg equation. Ask students to calculate the expected genotype ratios for a specific gene in a population under Hardy-Weinberg equilibrium.

Activity 3

Home Assignment:

https://quizizz.com/admin/quiz/63ec1cd9f1632c001e0504c4/natural-selection?fromSearch=true&source=null

Further Resources

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https://akueb.knowledgeplatform.com/login

Topic	Total Periods
27. Man and his Environment	4

Sub-Topic	Range of SLOs	Periods (40 mins)
27.1 Resources, 27.2 Man's Impact on Environment	27.1.1, 27.1.2 27.2.1- 27.2.3	1
27.2 Man's Impact on Environment, 27.3 Pollution	27.2.4 27.3.1- 27.3.2	1
27.4 Protection and Conservation of Environment and Biodiversity	27.4.1- 27.4.3	1
27.4 Protection and Conservation of Environment and Biodiversity, 27.5 Health and Diseases	27.4.4 - 27.4.5 27.5.1	1

Learning Resources

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Suggested Activities and/or Formative Assessment

Activity 1

Collaborative Research:

Organise students into small groups based on their chosen topics. Diversity within groups can encourage varied perspectives. Guide students in conducting thorough research using reputable sources to gather information about their chosen environmental issue.
Have each group create multimedia presentations, incorporating visuals, charts, graphs, and videos to effectively communicate their findings.
Assign groups to design informative infographics or posters that summarize key points about their chosen environmental topic.

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.

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