Biology
Paper 1
Form 2
2 hours 30 mins

END OF TERM ONE-2023

COMPETENCY-BASED CURRICULUM
S.3 BIOLOGY EXAMS
Time: 2 Hours

FOR EXAMINERS USE ONLY

Qn	1	2	3	4	5	6	8	9	10	11	12	13	14	Total
Marks														

Instructions
This paper consists of two sections; section A (40 marks) andsection B (60 marks). Section A consists of eight structured questions. Answer all thequestions in this section in the spaces provided.

Section B consists of six extended short essay questions. Attemptany four questions from this section.

Answers to this section must be written on the answer bookletprovided.

SECTION A (40 Marks)

Attempt ALL questions in this section

1. Animals are classified into several phyla, including Porifera (sponges), Cnidaria (jellyfish, corals), Mollusca (snails, clams, octopuses), Arthropoda (insects, spiders, crustaceans), and Chordata (fish, amphibians, reptiles, birds, mammals). Chordata is the most diverse and complex phylum, containing over 65,000 species of vertebrates, including humans.

(a) What are the key characteristics of Kingdom Animalia, including their mode of nutrition, and reproduction? *(1 ½ Marks)*

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(b) How do animals contribute to ecosystem processes such as nutrient cycling, pollination, and seed dispersal? *(1 ½ Marks)*

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(c) What are the major phyla of animals, and how do they differ in terms of morphology *(2 Marks)*

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2. Kingdom Fungi is a diverse group of eukaryotic organisms that includes yeasts, molds, mushrooms, and other filamentous forms. Fungi are characterized by their unique mode of nutrition, in which they absorb nutrients from their environment through their hyphae, which are thin filaments that make up the body of the fungus.

(a) What are the key characteristics of Kingdom Fungi, including their mode of nutrition and reproduction? *(2 marks)*

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(b) How do fungi contribute to ecosystem processes such as nutrient cycling and decomposition? *(1 mark)*

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(c) What are some examples of economically important fungi, and how are they used in agriculture, medicine, and industry? *(2 marks)*

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3. Mammals have different dietary requirements depending on their age, size, and activity level. For instance, growing animals and lactating females require more protein and energy than mature animals. Herbivores such as cows, horses, and deer have a complex digestive system that allows them to extract nutrients from fibrous plant material, while carnivores such as cats and dogs have a shorter digestive tract that facilitates the rapid absorption of nutrients from meat.

(a) What are the three types of carbohydrates commonly found in mammalian diets? *(1 ½ marks)*

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(b) How do proteins differ from carbohydrates and fats in terms of their chemical composition and role in the body? *(2 marks)*

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(c) What are the essential amino acids, and why are they important for mammalian nutrition? *(1 ½ Marks)*

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4. Enzymes are proteins that catalyze biochemical reactions in living organisms. They play a critical role in a wide range of physiological processes in mammals, including digestion, metabolism, and cellular signaling. Enzymes are highly specific and can catalyze reactions at rates that are millions of times faster than uncatalyzed reactions. The regulation of enzyme activity is crucial for maintaining cellular homeostasis and responding to changes in the environment.

(a) What are enzymes, and how do they catalyze biochemical reactions in the mammalian body? *(2 marks)*

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(b) What are the factors that affect enzyme activity, and how do they influence the rate of enzymatic reactions? *(1 ½ marks)*

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(c) What are the different classes of enzymes, and what are their roles in mammalian physiology? *(1 ½ marks)*

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5. Eating disorders are serious mental health conditions characterized by disturbances in eating behavior and body image. Eating disorders can have a range of physical and psychological consequences. Eating disorders affect people of all ages, genders, and backgrounds, and they have a significant impact on quality of life.

(a) What are the different types of eating disorders? *(1 ½ marks)*

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(b) What are the risk factors for developing an eating disorder, and how do they interact with environmental factors? *(1 ½ marks)*

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(c) What are the most effective treatments for eating disorders, and how do they address the underlying causes of these conditions? *(2 marks)*

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6. Chlorophyll is a pigment that plays a crucial role in photosynthesis, which is the process by which plants convert light energy into chemical energy in the form of glucose. Chlorophyll is responsible for absorbing light energy and using it to power the chemical reactions that drive photosynthesis. There are several different types of chlorophyll, but the most common form in plants is chlorophyll

(a) Explain the role of chlorophyll in photosynthesis and how it contributes to the production of glucose. *(2 Marks)*

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(b) Explain how changes in environmental factors, such as light intensity or temperature, can affect the efficiency of photosynthesis and the production of glucose. *(3 marks)*

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7. Soil is a complex mixture of organic and inorganic materials that forms the basis for plant growth and provides important ecosystem services such as nutrient cycling, water storage, and carbon sequestration. The physical and chemical properties of soil play a crucial role in determining its suitability for different types of plants and the overall health and productivity of ecosystems.

(a) Define the physical and chemical properties of soil and explain their importance in plant growth and ecosystem health. *(2 marks)*

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(b) Discuss the role of organic matter in soil fertility and nutrient availability, and describe how it can be incorporated into soil through composting and other methods. *(3 marks)*

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8. Mammalian teeth are specialized structures that have evolved to enable the efficient processing of food. Teeth are composed of multiple tissues, including enamel, dentin, and cementum, and they come in a range of shapes and sizes that reflect the diet and lifestyle of different mammalian species. Teeth play a critical role in the digestive process, helping to break down food into smaller particles that can be absorbed by the body. Tooth structure and function are also influenced by factors such as age, genetics, and environmental factors.

(a) What are the different types of mammalian teeth, and what are their functions in the digestive process? *(2 marks)*

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(b) How does the dental formula of different mammalian species reflect their dietary preferences and digestive needs? *(2 marks)*

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(c) What are the common dental problems that affect humans and other mammals? *(1 marks)*

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Section B. (60 marks)

Attempt 4 questions from this section

9. The alimentary canal, also known as the digestive track, is a long, muscular tube that extends from the mouth to the anus in mammals. The alimentary canal is responsible for the mechanical and chemical breakdown of food, the absorption of nutrients and water, and the elimination of waste. The alimentary canal includes several specialized organs, including the mouth, pharynx, esophagus, stomach, small intestine, large intestine, rectum, and anus. Each of these organs plays a specific role in the digestive process and is adapted to the particular dietary habits and digestive needs of the mammal.

(a) What are the different organs that make up the alimentary canal, and what are their specific roles in the digestive process? *(3 marks)*

(b) How is food moved through the alimentary canal, and what mechanisms are involved in this process? *(2 marks)*

(c) How is food broken down mechanically and chemically in the different organs of the alimentary canal, and what enzymes are involved in the chemical breakdown of food? *(8 marks)*

(d) What are some common diseases and disorders that affect the alimentary canal, and what are their causes and treatments? *(2 marks)*

10. Maize is one of the most widely cultivated crops in the world, and its growth and yield are strongly influenced by soil properties such as texture, structure, fertility, pH, and water content.

Investigating the growth of maize in different types of soils can help to identify the optimal soil conditions for maize cultivation and inform soil management practices for sustainable agriculture. To investigate the growth of maize in different types of soils, researchers can conduct experiments in controlled environments such as greenhouses or growth chambers, or in the field under different soil management practices and environmental conditions.

(a) What are the different soil types that can influence the growth of maize, and how do they differ in terms of texture, and water content? *(3 marks)*

(b) What are the optimal soil conditions for maize cultivation, and how can they be achieved through soil management practices? *(3 marks)*

(c) How can the growth of maize be measured and quantified, and what are the key indicators of growth such as plant height, biomass, leaf area, and yield? *(2 marks)*

(d) How can different soil properties such as texture, structure, fertility, pH, and water content affect the growth of maize, and what are the underlying mechanisms such as nutrient uptake, water availability, root development, and soil-borne diseases? *(5 marks)*

(e) How can climate and weather conditions such as temperature, rainfall, and drought affect the growth of maize in different types of soils? *(2 marks)*

11. Soil conservation refers to the practices and techniques used to prevent soil erosion and maintain soil health. Effective soil conservation strategies can help to prevent soil infertility, protect water quality, and promote sustainable agriculture and land use practices.

(a) Can you describe some common soil erosion control practices, such as cover cropping, terracing, and contour plowing? How do these practices work, and what are the benefits and drawbacks of each approach? *(5 marks)*

(b) How can soil amendments such as compost and manure be used to promote soil health and conservation? What factors should be taken into account when selecting and applying these amendments, and how can their effectiveness be measured? *(5 marks)*

(c) Have you ever encountered a situation where soil erosion was a major problem? How did you assess the situation, and what measures did you take to prevent further erosion? What were the results of your efforts? *(5 marks)*

12. Food nutrients are essential substances found in food that the body requires for growth, repair, and maintenance.

(a) What are the six major categories of nutrients and what are some examples of foods that are rich in each nutrient category? *(3 marks)*

(b) Why is it important to eat a variety of nutrient-rich foods, and what are some potential consequences of a diet that is lacking in certain nutrients? *(2 marks)*

(c) What are some of the key roles that protein plays in the body, and what are some healthy sources of protein that you would recommend to someone looking to increase their protein intake? *(5 marks)*

(d) How can dietary recommendations vary based on an individual's age, sex, and activity level, and what are some strategies for tailoring dietary advice to individual needs and preferences? *(2 marks)*

(e) Can you describe some of the key nutritional considerations for individuals with specific health conditions, such as diabetes, heart disease, or digestive disorders? *(3 marks)*

13. The external features of flowers include various parts such as petals, sepals, stamens, and pistils. These features are essential for flower reproduction and are responsible for attracting pollinators. The following are some brief descriptions of each part:

(a) Can you describe the different parts of a flower and their functions in reproduction? (5 *marks)*

(b) How can the external features of flowers be used to promote pollination and increase crop yield, and what are some common agricultural practices for flower management? *(5 marks)*

(c) What are some environmental factors that can affect the external features of flowers, such as temperature and humidity, and how can these factors impact flower growth and reproduction *(5 marks)*

14. Kingdom Plantae is a diverse group of multicellular eukaryotic organisms that includes mosses, ferns, gymnosperms, and angiosperms (flowering plants). Plants are characterized by their ability to photosynthesize, using sunlight, water, and carbon dioxide to produce organic molecules and oxygen.

(a) What are the key characteristics of Kingdom Plantae, including their mode of nutrition, cell structure, and reproduction? *(3 marks)*

(b) How do plants contribute to ecosystem processes such as nutrient cycling, the water cycle, and the balance of atmospheric gases? *(4 marks)*

(c) What are the major divisions of plants, and how do they differ in terms of morphology, ecological role? *(4 marks)*

(d) How have plants evolved over time to adapt to different environments, such as aquatic habitats, arid environments, and extreme temperatures? *(4 marks)*

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