



# TECHNICAL UNIVERSITY OF MOMBASA

---

Faculty of applied and health sciences

## DEPARTMENT OF PURE AND APPLIED SCIENCES UNIVERSITY EXAMINATION FOR:

DEPARTMENT OF PURE AND APPLIED SCIENCES  
DIPLOMA IN ANALYTICAL CHEMISTRY (DAC16S)  
AAB 2106 BIOLOGY II

### SPECIAL SUPPLEMENTARY EXAMINATION

**SERIES:SEPT. 2017**

**TIME:2HOURS**

#### Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of FIVE questions.

Answer Question ONE (compulsory) and any other TWO Questions.

**Do not write on the question paper.**

---

#### Question ONE

- (a)(i)List TWO characteristics of Division schizophyta (bacteria) 2 marks  
(ii)List TWO characteristics of prozoa II Kingdom 2 marks
- (b) (i) Name TWO classes of Anthophyta 2 marks  
(i)List TWO characteristics of Amphibians 2 marks
- (c )Explain the following types of heterotrophic nutrition;  
(i) Holozoic nutrition 1 mark  
(ii) Saprobiontic/saprotrophic 1 mark  
(iii) Parasitism 1 mark  
(iv) Carnivorous 1 mark
- (d)(i) Name TWO techniques for measuring heart diseases 2 marks  
(ii) List TWO types of excretory organs found in animals 2 marks
- (e) (i))Name types of movement exhibited by human body cells 3 marks  
(ii)State the function of afferent nerve fibre 1 mark
- (f) State the function of the following;  
(i)Somatic nervous system 2 marks  
(ii)Autonomic nervous system 2 marks
- (g) (i) Classify muscles based on their location 3 marks

(h) State TWO functions of osmoreceptors in the body 3 marks

**Question TWO**

(a) Explain how the autotrophic primary producers support ecosystems 8 marks

(b) Explain pulmonary circulation of blood 7 marks

**Question THREE**

(a) Explain homeostatic control of body temperature 7 marks

(b) Explain the mechanism of inspiration 8 marks

**Question FOUR**

(a) Explain the mechanism of a reflex action 8 marks

(b) Discuss the steps of respiration 7 marks

**Question FIVE**

(a) Explain function of the kidney tubules 8 marks

(b) Explain homeostatic control of blood glucose concentration 7 marks

S/NO	ANSWER	MARK
Q 1a)(i)	- Are unicellular, reproduce asexually by cell division, their nutrition is usually heterotrophic though some are photosynthetic.	2
(ii)	- microscopic organisms which reproduce by splitting, are heterotrophic, one-celled organisms that exhibit a remarkable degree of subcellular organization.	2
b)(i)	-Liliopsida Class -Magnoliopsida Class	2
(ii)	-have smooth skin, spend at least part of their life in water. Have two pair of limbs; a tongue that is often protrusible; Amphibians are cold-blooded. - have three life stages: egg, larva, adult. Includes	
c)(i)	(i) Holozoic nutrition: Complex food is taken into a specialist digestive system and broken down into small pieces to be absorbed. (ii) Saprobiontic/saprotrophic: Organisms feed on dead organic remains of other organisms. (iii) Parasitism: Organisms obtain food from other living organisms (the host), with the host receiving no benefit from the parasite (vi) organisms rely on autotrophs indirectly, as the nutrients obtained from their heterotroph prey come from autotrophs they have consumed.	4
d)(i)	- Electrocardiogram—for cardiac electrophysiology - Sphygmomanometer and stethoscope—for blood pressure - Pulse meter—for cardiac function (heart rate, rhythm, dropped beats) - Pulse—commonly used to determine the heart rate in absence of certain cardiac pathologies	2
(ii)	-Malpighian tubules -Nephridia -Antennal glands	2
e)(i)	-Amoeboid Movement:- Some specialised cells in our body like macrophages and leucocytes Ciliary Movement: Ciliary movement occurs in most of our internal tubular organs which are lined by ciliated epithelium. -Muscular Movement:- Movement of our limbs, jaws, tongue, etc, require muscular movement.	3
(ii)	-transmit impulses from tissues/organs to the CNS	1
f)(i)	- The somatic nervous system relays impulses from the CNS to skeletal muscles	2
(ii)	-The autonomic nervous system transmits impulses from the CNS to the involuntary organs and smooth muscles of the body.	2

g)(i)	i) . Based on their location, three types of muscles are identified: (i) Skeletal (ii) Visceral (iii) Cardiac.	3
(ii)		
h)	<p>) Osmoreceptors in the body are activated by changes in blood volume, body fluid volume and ionic concentration.</p> <p>-An excessive loss of fluid from the body can activate these receptors which stimulate the hypothalamus to release antidiuretic hormone (ADH) or vasopressin from the neurohypophysis.</p> <p>-ADH facilitates water reabsorption from latter parts of the tubule, thereby preventing diuresis.</p> <p>-An increase in body fluid volume can switch off the osmoreceptors and suppress the ADH release to complete the feedback.</p> <p>-ADH can also affect the kidney function by its constrictory effects on blood vessels. This causes an increase in blood pressure. An increase in blood pressure can increase the glomerular blood flow and thereby the GFR</p>	3
Q2 (a)	<p>-Most ecosystems are supported by the autotrophic primary production of plants that capture photons initially released by nuclear fusion reactions in the sun.</p> <p>-The process of photosynthesis splits a water molecule (H<sub>2</sub>O), releasing oxygen (O<sub>2</sub>) into the atmosphere, and reducing carbon dioxide (CO<sub>2</sub>) to release the hydrogen atoms that fuel the metabolic process of primary production.</p> <p>-Plants convert and store the energy of the photon into the chemical bonds of simple sugars during photosynthesis.</p> <p>-These plant sugars are polymerized for storage as long-chain carbohydrates, including other sugars, starch, and cellulose; glucose is also used to make fats and proteins.</p> <p>-When autotrophs are eaten by heterotrophs, i.e., consumers such as animals, the carbohydrates, fats, and proteins contained in them become energy sources for the heterotrophs.</p> <p>-Proteins can be made using nitrates, sulfates, and phosphates in the soil</p>	8 MARKS
(b)	<p>Pulmonary circulation</p> <p>-The pulmonary circulatory system is the portion of the cardiovascular system in which oxygen-depleted blood is pumped away from the heart, via the pulmonary artery, to the lungs and returned, oxygenated, to the heart via the pulmonary vein.</p> <p>-Oxygen deprived blood from the superior and inferior vena cava, enters the right atrium of the heart and flows through the tricuspid valve (right</p>	7

	<p>atrioventricular valve) into the right ventricle, from which it is then pumped through the pulmonary semilunar valve into the pulmonary artery to the lungs.</p> <ul style="list-style-type: none"> <li>- Gas exchange occurs in the lungs, whereby CO<sub>2</sub> is released from the blood, and oxygen is absorbed.</li> <li>-The pulmonary vein returns the now oxygen-rich blood to the left atrium</li> </ul>	
Q3(a)	<p>The sensors are found in the hypothalamus.  Effectors are found in the skin and in muscles.  The fixed point for regulation is around 37.8 degrees centigrade.  Note the particular features of skin which are involved in temperature regulation:  Hairs with the erector pili muscle  Sweat glands  Blood arterioles  The skin is an effector in the control of body temperature.  It is particularly important to prevent cooling or overheating of the core (essential organs and brain)  When body temperature rises:  Blood flow to the surface is increased.</p>	7 marks
(b)	<ul style="list-style-type: none"> <li>-The contraction of diaphragm increases the volume of thoracic chamber in the antero-posterior axis. ---The external inter-costal muscles contract to lift up the ribs and the sternum.</li> <li>-This causes an increase in the volume of the thoracic chamber in the dorso-ventral axis.</li> <li>-The overall increase in the thoracic volume results in a similar increase in pulmonary volume.</li> <li>-The increase in pulmonary volume decreases the intra-pulmonary pressure to less than the atmospheric pressure.</li> <li>-This pressure gradient forces the air from outside to move into the lungs and inspiration takes place.</li> </ul>	8
Q4(a)	<ul style="list-style-type: none"> <li>-Reflex pathway comprises at least one afferent neuron (receptor) and one efferent (effector or excitor) neuron appropriately arranged in a series.</li> <li>- The afferent neuron receives signal from a sensory organ and transmits the impulse via a dorsal nerve root into the CNS (at the level of spinal cord).</li> <li>-The efferent neuron then carries signals from CNS to the effector. The stimulus and response thus forms a reflex arc</li> </ul>	8
(b)	<p>Steps of Respiration:</p> <ul style="list-style-type: none"> <li>- Breathing or pulmonary ventilation facilitates intake of atmospheric air and</li> </ul>	7

	<p>expulsion of alveolar air.</p> <ul style="list-style-type: none"> <li>-Diffusion of gases takes place across alveolar membrane.</li> <li>-Oxygen is transported to the tissue by blood.</li> <li>-Diffusion of O<sub>2</sub> and CO<sub>2</sub> takes place between blood and tissues.</li> <li>-Catabolism leads to utilization of O<sub>2</sub> by the cells and release of CO<sub>2</sub>.</li> </ul>	
Q5(a)	<p>-Proximal Convolved Tubule (PCT): Increases the surface area for reabsorption. essential nutrients, and 70-80 per cent of electrolytes and water are reabsorbed by this segment.</p> <p>-Helps to maintain the pH and ionic balance of the body fluids by selective secretion of hydrogen ions, ammonia and potassium ions into the filtrate and by absorption of HCO<sub>3</sub><sup>-</sup> from it.</p> <p>-Henle's Loop: maintenance of high osmolarity of medullary interstitial fluid.</p> <ul style="list-style-type: none"> <li>-The descending limb of loop of Henle is permeable to water but almost impermeable to electrolytes. This concentrates the filtrate as it moves down.</li> <li>-The ascending limb is impermeable to water but allows transport of electrolytes actively or passively.</li> </ul> <p>-Distal Convolved Tubule (DCT): Conditional reabsorption of Na<sup>+</sup> and water takes place in this segment.</p> <ul style="list-style-type: none"> <li>- DCT is also capable of reabsorption of HCO and selective secretion of hydrogen and potassium ions and NH<sub>3</sub> to maintain the pH and sodium potassium balance in blood.</li> </ul> <p>-Collecting Duct: It also plays a role in the maintenance of pH and ionic balance of blood by the selective secretion of H<sup>+</sup> and K<sup>+</sup> ions</p>	8
(b)	<p>) Blood sugar concentration is regulated for a number of reason amongst which: <u>Osmosis</u>. content of a tissue is determined by the concentration of the surrounding tissues.</p> <p><u>Respiration</u>: Some tissues are entirely dependent on blood sugar as a respiratory substrate being unable to either store glucose or metabolise fat</p> <ol style="list-style-type: none"> <li>a) Low glucose concentration is detected by the pancreas</li> <li>b) Alpha cells in the pancreatic islets secrete glucagon</li> <li>c)Glucagon flows through the blood to the liver.</li> <li>d)Liver responds by adding glucose to blood stream.</li> <li>e) High blood glucose levels stimulate the beta pancreatic cells</li> <li>f) Beta pancreatic cells secrete insulin</li> <li>g)Insulin flows through the blood to the liver</li> <li>h)Insulin stimulates the liver to remove blood glucose and store this as glycogen (insoluble)</li> </ol> <p>The response and change in blood glucose levels becomes the new stimuli for receptors</p> <p>This is a typical feedback control.</p>	7

--	--	--

## **AAB 2106 Biology II**

### **Prerequisites:**

Biology I

### **Purpose:**

The course is intended to equip trainee with a basic understanding of taxonomy and physiology of various body systems.

### **Objectives:**

By the end of the course trainee should be able to:

- i) Classify organisms
- ii) Describe structure and working of various body systems.
- iii) Explain the interdependence of organisms in natural habitat

### **COURSE DESCRIPTION**

Taxonomy; principles of classification. Nutrition; Autotrophism and heterotrophism. Transport in plants and animals. Respiration; Types, gaseous exchange and chemistry of respiration. Reproduction: Asexual and sexual, birth control. Excretion: Process of excretion, Homeostasis and factors affecting excretion. Nervous system: Organisation, Nerve impulses, Synapse and reflex action. Locomotion: Muscles skeletons and movements. Ecology; food chains and webs, ecological cycles and global warming-

### **Teaching Methodology:**

Demonstrations, lectures and tutorials.

### **Instructional Materials/Equipment:**

Chalkboard, slide and overhead/LCD projector, handouts and computers.

**Course Assessment:**

Continuous assessments and end of semester examinations