Name	***************************************	Signature
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P530/1		
BIOLOGY		
THEORY		
PAPER 1		
<b>SENIOR Five</b>		
Time 2 ½ HOU	<b>IRS</b>	

## **EXCEL HIGH SCHOOL**

## Uganda Advanced Certificate of Education S5 BIOLOGY MID TERM ONE EXAMS (THEORY) Paper ONE

## 2 Hours 30 Minutes

1. A group of A-Level Biology students visited a university lab and observed cells using an electron microscope. They noticed that some cells had visible nuclei and membrane-bound organelles while others did not. One student asked the lab technician why some cells lacked nuclei and complex structures.
i. Differentiate between the two types of cells observed. (4marks)
ii. Identify examples of organisms for each cell type. (3marks)
iii. Outline four key features present in eukaryotic cells but absent in prokaryotic cells.
(3marks)

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iv. Explain how ribosomes differ in these two cell types. (2.5marks)
2. During a lab session, senior biology students studied muscle tissues from two individuals—one a long-distance runner and the other a non-athlete. Under an electron microscope, they observed that the athlete's muscle cells contained a significantly higher number of mitochondria
compared to those of the non-athlete. Their teacher explained that this difference had something
to do with energy demands placed on the cells by the body's activity level.
i. What is the function of mitochondria in cells? (1marks)
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ii. Explain why muscle cells of athletes have more mitochondria. (2marks)
iii. Describe two structural adaptations of mitochondria that suit them to their function. (5marks)
iv. Compare mitochondria to chloroplasts in terms of energy transformation. (4.5marks)

3. During a biology laboratory experiment, students were investigating the effect of alcohol on liver cells. They treated two liver samples—one with ethanol and the other left untreated. After some time, the ethanol-treated cells were found to have leaked enzymes and other substances into the surrounding solution. The untreated cells remained intact. Their teacher explained that alcohol affects the integrity of the cell membrane, altering its permeability and fluidity. This led to a class discussion on the composition and functions of the cell membrane.
i. Describe the structure of the cell membrane based on the fluid mosaic model. (5marks)
ii. Explain how alcohol disrupts the structure and function of the cell membrane. (1marks)
iii. How the structure of the cell membrane in an animal cell related to its function. (4marks)

4. A group of A-Level Biology students visited a commercial greenhouse where tomatoes were grown under controlled conditions. They observed that some plants in shaded areas had yellowish leaves and stunted growth, while those receiving adequate sunlight remained green and healthy. The greenhouse manager explained that insufficient light affects chloroplas function, limiting the plant's ability to manufacture food. One curious student asked how exactly this tiny green organelle is responsible for making food in plants.
i. Name the pigment found in chloroplasts and state its role in the plant cell. (2marks)
ii. Describe the internal structure of a chloroplast and how it is suited for photosynthesis (6marks)

iii. Explain why the leaves turned yellow in plants grown under shade. (2marks)
iv. Give two differences between chloroplasts and mitochondria based on their structure and function. (2.5marks)
5. A group of A-Level Biology students watched a documentary about desert birds that could
survive for several days without drinking water. The narrator explained that these birds rely heavily on stored fats for both energy and water. This caught the students' interest, and their teacher further explained that lipids such as triglycerides are not only efficient energy reserves but also provide <b>metabolic water</b> upon oxidation. In their revision, they also discovered that lipids are hydrophobic, form important structures like cell membranes, and occur in different forms such as phospholipids, waxes, and steroids. The students were amazed at how such simple organic compounds could have so many critical roles.
i. Describe the structure of a triglyceride and explain how it is formed from its components. (3marks)
ii. Explain 4 reasons why lipids are suitable for long-term energy storage in desert birds. (3marks)

iii. Differentiate between saturated and unsaturated fatty acids, giving one example of each. (2marks)
iv. Discuss the role of phospholipids in the structure and function of cell membranes. (4.5marks)
6. During a practical biology session, students observed the physical changes that occur when an egg is boiled. They noted that the transparent egg white (albumin) turned solid and opaque. Their teacher explained that the heat caused the albumin protein to lose its natural shape, a process called denaturation. She further explained that although the amino acid sequence remained unchanged, the protein's function and solubility were lost. The class then discussed how protein structure relates to its role and how factors like pH and temperature can impact it.
i. Explain the term denaturation and give two causes of it as seen in the experiment. (2.5marks)
ii. Outline the four types of bonds that maintain a protein's tertiary structure. (2marks)

iii. Describe how the molecular structure of globular proteins is related to their roles. (5 marks
iv. Discuss why proteins are not suitable for long-term energy storage in animals, unlike lipids (3marks)
7. In a science exhibition, students tested how pepsin, a protein-digesting enzyme, behaves under different pH levels and temperatures. They observed that pepsin worked best in acidic conditions but lost activity when exposed to very high temperatures or extreme alkaline environments. Their teacher explained that this was due to changes in the protein's shape and folding caused by breaking of weak bonds, rendering the enzyme inactive.
i. What is the biological role of pepsin and what type of protein is it? (2marks)
ii. Describe how changes in pH and temperature affect the structure of enzymes. (5marks)

iii. Explain the importance of the tertiary structure in enzyme function. (2.5marks)
iv. Give two types of bonds that are broken during enzyme denaturation and the effects of
breaking them. (3marks)
8. During a biology practical lesson, students investigated the effect of temperature on the activity of amylase—an enzyme that breaks down starch into maltose. They prepared test tubes with starch solution and amylase, then placed them in water baths at different temperatures. At regular intervals, they measured the amount of maltose formed. The results were plotted and the graph below was drawn:
i. Describe the trend shown in the graph and identify the optimum temperature for amylase
activity. (2.5marks)

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ii. Explain why th (4marks)	ne enzyme activity	increases w	ith temperatu	re up to the	optimum point.
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iii. Describe what function. (3marks)	happens to the enz	yme structui	re beyond 45°	C and how it	affects enzyme
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iv. Suggest two bio	ological consequenc	es of enzym	e denaturation	in human cel	lls. (2.5marks)
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WISH YOU THE BEST

JAMES 1:5