

Name..... Signature.....

P530/1
BIOLOGY
THEORY
PAPER 1
SENIOR Five
Time 2 ½ HOURS

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)

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ii. Identify examples of organisms for each cell type. (3marks)

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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)

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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? (1 marks)

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ii. Explain why muscle cells of athletes have more mitochondria. (2marks)

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iii. Describe two structural adaptations of mitochondria that suit them to their function. (5marks)

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iv. Compare mitochondria to chloroplasts in terms of energy transformation. (4.5marks)

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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)

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ii. Explain how alcohol disrupts the structure and function of the cell membrane. (1marks)

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iii. How the structure of the cell membrane in an animal cell related to its function. (4marks)

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iii. Explain why the leaves turned yellow in plants grown under shade. (2marks)

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iv. Give two differences between chloroplasts and mitochondria based on their structure and function. (2.5marks)

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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 **metabolic water** 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)

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ii. Explain 4 reasons why lipids are suitable for long-term energy storage in desert birds. (3marks)

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iii. Describe how the molecular structure of globular proteins is related to their roles. (5 marks)

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iv. Discuss why proteins are not suitable for long-term energy storage in animals, unlike lipids. (3marks)

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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)

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ii. Describe how changes in pH and temperature affect the structure of enzymes. (5marks)

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ii. Explain why the enzyme activity increases with temperature up to the optimum point. (4marks)

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iii. Describe what happens to the enzyme structure beyond 45°C and how it affects enzyme function. (3marks)

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iv. Suggest two biological consequences of enzyme denaturation in human cells. (2.5marks)

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WISH YOU THE BEST

JAMES 1:5