P530/2
BIOLOGY
Paper 1
(Practical)
Aug. 2026
2 hours

REGINA PACIS HIGH SCHOOL – MUKONO

Uganda Advanced Certificate of Education

BIOLOGY

Paper 2
(Practical)

2 HOURS

ITEM 1

A biomedical research unit is developing a stabilized intravenous nutritional solution for intensive care patients. The solution must maintain a near-constant pH to prevent disruption of enzyme activity in blood and tissues. Three food samples **A**, **B** and **C**, obtained from different biological sources, are available for evaluation. Their effectiveness as pH buffers is assessed by observing their resistance to pH change when 1-2 drops of dilute acid and dilute alkali are added in the presence of **universal indicator**, and the resulting pH changes noted.

The formulation also requires a lipid-based energy component capable of forming a stable emulsion in an aqueous medium similar to blood plasma. Two lipid samples, **D** and **F**, one derived from a fat and the other an oil, are available for testing. Their emulsion stability is assessed by treating each with a fixed emulsifier **X**, adding an equal volume of water, and shaking the mixture vigorously. Stability is indicated by the persistence of one cloudy emulsion layer for a longer period of time before separating.

You are provided with protein samples **A**, **B** and **C**; lipid samples **D** and **F**; and emulsifier **X**.

Task:

Design and carry out an investigation to determine the protein sample with the greatest buffering capacity and the lipid sample that forms the most stable emulsion in water. Your results to recommend the most suitable protein and lipid for inclusion in the intravenous nutritional solution.

Your report should include: Aim, hypothesis, variables, and sources of error, risks, their mitigations, procedure, data presentation, data analysis and explanation of results, conclusion and recommendations.