Appendix 1: Research Paper Questions

Instructions

Choose two subjects of your choice, and from each subject, choose one topic of your choice to attend to as a team.

BIOLOGY

1. **The Fermentation Safety Mystery:** In many Ugandan homes, fermented drinks like *bushera* and *malwa* are brewed in open, unsterile containers. Strangely, these drinks rarely cause food poisoning despite their high microbial content. What hidden biological "gatekeepers" or microbial interactions make these drinks safe, and how do the microbes decide which species dominate during fermentation?

2. **Why Do Mosquitoes Prefer Certain People?** In one family sitting outside on a warm evening, some members are relentlessly bitten by mosquitoes while others remain largely unbothered. What subtle biological signals tip the mosquito's choice, and do these preferences change with environment or season?

PHYSICS

1. **The Motorcycle Headlamp Mystery:** Boda bodas (motorcycles) on Kampala roads often replace factory bulbs with "brighter" aftermarket ones. Yet riders sometimes report that the road looks dimmer even though the light appears whiter and stronger to the eyes. Why does increasing brightness not always improve visibility at night, and what physics of scattering, glare, and human eye perception is at play?

2. **The Wi-Fi Corner Paradox:** In a Kampala apartment, a Wi-Fi hotspot in the sitting room shows strong signals in a far corner near the balcony, but the signal weakens drastically right next to the router on the bed. Why would electromagnetic waves behave so unpredictably in such a small space, and what roles do reflections, interference, and building materials play?

CHEMISTRY

1. **The Ugali Hardening Riddle:** Freshly cooked posho/ugali is soft and elastic, but within a few hours it hardens into a firm block even when kept warm. What molecular changes in the starch structure drive this transition, and why does reheating sometimes restore softness only partially?

2. **The Boiled Egg Shell Riddle:** When boiling eggs, some shells peel off cleanly while others stubbornly stick to the egg white. What chemical changes during boiling determine whether an egg will peel smoothly or not?

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