

UGANDA NATIONAL EXAMINATIONS BOARD (UNEB)

Uganda Certificate of Education (UCE) Chemistry Past Items Compilation

Subject Code: 545/1 (Paper 1)

New Lower Secondary Curriculum (NLSC)

Formative Chemistry Board Review

General Instructions:

- This document combines the authentic, competency-based scenario items from the 2024 and 2025 UCE Chemistry Papers.
- All items conform to the three elements of construct under the new framework: *Context/Situation*, *Response/Task*, and *Scoring Criteria*.
- Write your answers clearly in the spaces provided below each task.

SELECTED ITEMS FROM THE 2024 UCE CHEMISTRY PAPER

Item 1: Water Quality and Detergent Assessment

Onyera, a resident in a local trading center, noticed that when washing clothes using local borehole water with a soapy detergent, a sticky, greyish-white solid scum forms, making it difficult to produce foam unless massive amounts of the soap are used. However, a neighbor who used a synthetic soapless liquid detergent experienced excellent lathering instantly with the same water supply. Onyera wants to understand why these differences occur and how this affects water resource sustainability.

(a) Explain the chemical cause behind the formation of the sticky scum when soapy detergent is mixed with the borehole water. [4 marks]

(b) Contrast the chemical action of soapy and soapless detergents in hard water and recommend the most suitable option for Onyera. [6 marks]

Item 2: Industrial Gaseous Safety & Protection

A small-scale chemical plant producing chlorine gas experiences a structural failure in a pipe fitting, releasing small amounts of green-yellow gas into an enclosed packaging room. A first-aid responder enters the room carrying a cloth soaked in a weak chemical solution to neutralize the gas effect on workers, while safety managers plan a long-term urban chemical plant layout to minimize socio-economic hazards.

(a) Identify an appropriate chemical substance that can be used on the cloth to safely trap or react with leaking chlorine gas before inhaling, explaining its reaction mechanism. [5 marks]

(b) Outline two major socio-economic and environmental impacts of establishing a heavy chlorine chemical production plant within an urban community zone. [5 marks]

SELECTED ITEMS FROM THE 2025 UCE CHEMISTRY PAPER

Item 1: Food Additives & Biochemistry in Local Sauces

When preparing chicken sauce for her family at home, Jane adds common salt only. However, when she visited a local restaurant, Jane noted that the chicken sauce served to her contained onions, tomatoes, and curry powder in addition to common salt. Jane was highly impressed by the restaurant sauce, which tasted much better and had a richer aroma than the one she prepares at home. She wants to know more about the chemical classification and functions of these restaurant ingredients.

(a) State the chemical/dietary category of these collective ingredients and state the primary function of each item used in the restaurant sauce. [4 marks]

(b) State the scientific similarities and chemical differences between common salt and the other biological ingredients (onions, tomatoes, curry powder). [6 marks]

Item 2: Periodic Table Predictions & Medical Geology

Mary, a 60-year-old resident, complains of dental caries, chronic joint pains, and frequent muscular cramps. During one of her visits to a local healthcare facility, the doctor advised her to drink water directly from a newly constructed community bore hole because it contains a mineral compound that can solve her specific physiological problems. Her chemistry teacher mentions that this compound is written as XY_2 , where X belongs to Group II, Period 4, and Y belongs to Group VII, Period 2 of the periodic table of the first 20 elements.

(a) Identify elements X and Y using their periodic position, and explain the physical nature of the compound XY_2 formed between them. [5 marks]

(b) Explain how the specific chemical ions provided by compound XY_2 directly address Mary's healthcare complaints, and state one impact of having an excess concentration of this compound in the environment. [5 marks]

Item 3: Soil Nitrogen Management & Ecosystem Impact

An agricultural cooperative wants to boost its crop yield using ammonium nitrate fertilizer (NH_4NO_3). Nearby, a vehicle washing bay releases untreated wastewater containing oil, grease, and structural residues directly into the local river system that borders the farming fields. The farmers need to balance increasing their soil fertility while safeguarding the local river ecosystem from agricultural and industrial runoff.

(a) Describe how nitrogen levels provided by ammonium nitrate enhance soil fertility and crop health, and write down an ionic representation for its dissolution. [5 marks]

(b) Analyze how untreated wastewater from vehicle washing bays combined with fertilizer runoff harms river ecosystems, and propose two mitigation measures. [5 marks]